



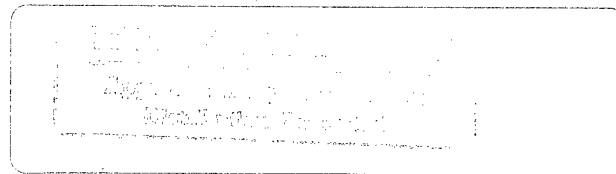
United States General Accounting Office

Report to the Ranking Minority Member,
Committee on Governmental Affairs,
U.S. Senate

October 1997

DEFENSE IIRM

Poor Implementation of Management Controls Has Put Migration Strategy at Risk



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United States
General Accounting Office
Washington, D.C. 20548

**Accounting and Information
Management Division**

B-275670

October 20, 1997

The Honorable John Glenn
Ranking Minority Member
Committee on Governmental Affairs
United States Senate

Dear Senator Glenn:

As you know, in 1989, the Department of Defense started its Corporate Information Management (CIM) initiative in an effort to save billions of dollars by streamlining operations and deploying standard information systems to support common business operations. A key part of this initiative is Defense's migration effort, which involves replacing its functionally duplicative and inefficient automated information systems with the Department's best existing information systems. Concerned that the billions of dollars projected to be spent on CIM-related technology efforts are at high risk, you asked that we provide information on the status and progress of Defense's migration effort and assess whether Defense has effective controls in place to manage and oversee the initiative. This report also highlights the implications of our findings for Defense as it responds to investment management requirements of the Clinger-Cohen Act of 1996.

We are sending copies of this report to the Chairman of the Senate Committee on Governmental Affairs and to the Chairmen and Ranking Minority Members of the Senate Committee on Armed Services; Subcommittee on Defense, Senate Committee on Appropriations; House Committee on National Security; Subcommittee on National Security, House Committee on Appropriations; and Senate and House Committees on the Budget; the Secretary of Defense; the Acting Assistant Secretary of Defense for Command, Control, Communications and Intelligence; the Acting Under Secretary of Defense (Comptroller); and the Director, Office of Management and Budget. Copies will also be made available to others upon request.

If you have any questions about this report, please call Mickey McDermott, Assistant Director, at (202) 512-6240. Other major contributors to this report are listed in appendix V.

Sincerely yours,

Jack L. Brock, Jr.
Director, Defense Information and
Financial Management Systems

2000 OCT 21 10:10 AM

Executive Summary

Purpose

In 1989, the Department of Defense started its Corporate Information Management (CIM) initiative in an effort to save billions of dollars by streamlining operations and deploying standard information systems to support common business operations. However, 8 years after beginning CIM and making substantial investments, Defense has not met its savings goal because it has not fully implemented sound management practices to carry out this initiative. GAO placed the effort on its high-risk list in February 1995, in part because it found that CIM-related technology investments, which are expected to total billions of dollars each year, are vulnerable to waste and mismanagement.

A key part of CIM is Defense's migration effort, which involves replacing its functionally duplicative and inefficient automated information systems with the best existing systems. Defense believes that migration can cut costs associated with developing and maintaining disparate systems supporting the same functions. It also believes that if done properly, migration can help standardize business processes. Concerned that billions of dollars projected to be spent on CIM-related technology efforts are at high risk, the Ranking Minority Member of the Senate Committee on Governmental Affairs asked GAO to (1) provide information on the number and cost of systems designated for migration, the number of legacy systems already terminated or scheduled for termination, and savings resulting from terminations of legacy systems and (2) determine whether Defense's management control and oversight processes for migration systems are ensuring that the investments are economically sound and in compliance with its technical and data standards.

Background

When it initiated CIM, Defense believed that the thousands of automated information systems supporting its business operations—which include such functions as logistics, communications, personnel, health affairs, and finance—were redundant and inefficient. These operations were traditionally carried out in isolation by the individual military services and Defense agencies. As such, the information systems supporting these discrete operations were developed independently even though they may well have served similar purposes.

DOD's CIM initiative included several aspects: (1) corporate policy/planning, (2) process and data modeling, (3) process improvement, (4) performance measurement, (5) standard information systems, and (6) computing and communications infrastructure. As CIM was implemented, Defense emphasized two ways of achieving process improvements and addressing

problems associated with its disparate and stovepiped information technology environment: (1) reengineering business processes first and then applying technology to the new processes and (2) selecting the best DOD information systems from pools of existing, or legacy, systems that provide the same automated support services and eventually replacing the duplicative systems with the best systems. The second approach is known as migration.

In October 1993, Defense embarked on an "accelerated" migration strategy, which placed more emphasis on the second improvement approach. As part of this strategy, it asked its managers to select migration systems in 6 months and develop and deploy them departmentwide in the following 3 years. Defense believed that instilling pressure to select and deploy migration systems would reap savings much quicker than streamlining or reengineering the business processes and acquiring systems after those processes were reengineered.

The consequence of the increased emphasis on migration was that the dramatic gains that could be achieved through reengineering would be postponed. This impaired the chances of CIM achieving its objectives for dramatic improvements and cost savings in several respects. First, it kept Defense from focusing on redesigning core business processes, which promised order-of-magnitude improvements. Second, it increased the risk that bad business processes would be perpetuated. Third, it would make future reengineering efforts more difficult by entrenching inefficient and ineffective work processes. As a result, reengineering never took hold in many of DOD's functional areas. The migration arm of CIM, however, is still active.

Results in Brief

From fiscal years 1995 through 2000, Defense plans to spend at least \$18 billion on migration. It has selected 363 migration systems and has targeted 1,938 legacy systems for potential termination. Despite this substantial investment, Defense did not adhere to decision-making and oversight processes it established to ensure that the economical and technical risks associated with migration projects have been mitigated.

Defense's primary corporate-level control mechanism for ensuring that sound management and development practices were followed for each migration investment has not been effective. This control requires that all migration system selections be approved by the Assistant Secretary of Defense for Command, Control, Communications and Intelligence

(ASD C3I). Despite this requirement, about 67 percent of migration selections were never submitted for approval, and many of those that were submitted were approved in the absence of critical technical and programmatic support. Consequently, Defense does not have assurance that the migration systems being developed will help achieve its technology goals and that sound business decisions were made in selecting the systems.

Because this control mechanism did not support the migration effort, GAO also assessed whether Defense's traditional acquisition oversight processes, which are designed to help ensure that individual major information system investments are economically and technically sound, were helping to ensure that the risks associated with migration were mitigated. However, these processes also did not support the migration effort because they have not fully ensured that economic analyses for migration projects are prepared and reviewed and that the systems comply with technical and data standards. For example, economic analyses for 12 of 43 major migration systems—for which Defense has invested hundreds of millions of dollars in total—have not yet been submitted for independent review. Delaying the preparation of an economic analysis to the later stages of development defeats the purpose of the analysis—to demonstrate that a proposal to invest in a new system is valid before that investment is made.

Had there been more rigorous attention to established oversight procedures and sound business practices, Defense might well have avoided the migration problems GAO identified in previous reviews, which unnecessarily cost the Department hundreds of millions of dollars. One functional area, for example, embarked on and later abandoned a substantially flawed effort to develop a standard suite of migration systems for materiel management after spending over \$700 million without strong oversight. In addition, some functional areas did not account for various categories of significant costs when making their migration decisions or adequately consider alternatives to developing systems in-house.

In implementing the migration strategy, Defense did not ensure that it had adequate departmentwide visibility over status, costs, and progress. As a result, it could not provide accurate and reliable information, as requested, on the number and cost of systems designated for migration, and the numbers of systems terminated and scheduled to be terminated. Furthermore, the Department has not been able to convincingly demonstrate whether the migration strategy has been successful or not,

and it has not been able to provide the Congress with accurate and reliable information needed for decision-making purposes.

Defense has taken a positive step to turn around its information technology investment process as part of its implementation of the Clinger-Cohen Act of 1996 (Division E of Public Law 104-106). This legislation requires federal agencies to have processes and information in place to help ensure that information technology projects (1) are being implemented at acceptable costs, within reasonable and expected time frames, and (2) are contributing to tangible, observable improvements in mission performance. In June 1997, the Secretary of Defense outlined his expectations for improvements in management processes and information resources related to information technology. These expectations incorporate some of the most important elements of the Clinger-Cohen Act and are an excellent starting point for bringing meaningful change to the current information technology management process. Additionally, the Department's Task Force on Defense Reform is currently examining the current structure of the Chief Information Officer (CIO) position to ensure that the CIO can devote full attention to reforming information resources management within the Department.

In implementing the Clinger-Cohen Act, the Department faces a formidable challenge in successfully implementing real change across an organizational structure that has clearly defined roles and responsibilities for the three individual services to execute national defense policy and objectives. The separation of budget authority, program execution, and functional authority have all contributed to an environment that has fostered stovepipe systems within each service and has made departmentwide oversight difficult. For Clinger-Cohen implementation to make a difference, any new processes or requirements must be successfully accomplished within this environment.

Principal Findings

Management Control Processes Over Individual Migration Efforts Have Broken Down

Defense's primary corporate-level control mechanism for ensuring that sound management and development practices are followed for each migration investment has not been effective. This control requires the functional area manager, known as the Principal Staff Assistant¹ (PSA), to

¹The PSA is the senior executive-level manager who is responsible for the management of a defined function or functions within the DOD.

submit all systems selected for migration for approval by the Assistant Secretary of Defense for Command, Control, Communications and Intelligence. This approval is important because the Assistant Secretary, as the Department's Chief Information Officer, needs to ensure that DOD's technology-related goals are met.

However, this control mechanism has broken down in two respects. First, even though all system selections should have been submitted for review and approval by the Assistant Secretary, 245 of the 363 selections were never submitted for this oversight. Second, most of the systems that were submitted for this review were approved in the absence of critical technical and programmatic support. Specifically, about 19 percent were approved without supporting technical justification and about 54 percent were approved without documents showing that the functional area had evaluated different options for improving a business area, such as reengineering. Because all of the migration selections submitted for this oversight have been approved—whether adequately supported with technical and programmatic justification or not—this control has essentially become meaningless.

Because the oversight from the ASD C3I that was specifically established for migration selections has been marginal in trying to ensure that sound management and development practices are followed for migration selection, GAO assessed whether the Department's traditional major information systems acquisition oversight processes were doing so for 43 of the major migration systems.² Major systems are Defense's most expensive and critical information systems and can cost up to hundreds of millions of dollars to develop. These review processes are designed to assess whether projects are affordable and financial and operational risks have been minimized.

However, these processes did not provide sufficient assurance that the systems (1) were economically justified or (2) complied with Defense's technical and data standards—which are intended to help pave the way toward an interoperable systems environment. For example, economic analyses or updates of previously prepared economic analyses for 12 of the 43 systems had not been submitted for independent review. These 12 systems are under development or modernization and Defense has invested hundreds of millions of dollars in them. In addition, even though the Department recognizes that economic analyses play a critical role in

²There are 49 major migration systems; however, GAO's review focused on the 43 major migration systems under the oversight of the Major Automated Information System Review Council. The remaining six systems are under the oversight of the Defense Acquisition Board.

assessing whether system development efforts will be cost-effective and beneficial, it has not yet published official guidance to standardize the methodology and analytic techniques for preparing economic analyses.

GAO's previous reviews of migration systems identified a number of problems that could have been prevented had there been better oversight by the Major Automated Information System Review Council (MAISRC) and the ASD C3I. For example, GAO's review of the materiel management migration strategy showed that a functional area was able to embark and spend over \$700 million pursuing a substantially flawed effort—which was later abandoned—without rigorous department-level oversight. In addition, in previous reviews of migration efforts in depot maintenance, transportation, and finance, GAO found that functional areas failed to account for various categories of significant costs when making their migration decisions—including costs related to interfacing migration systems with other systems, project management, and the system selection process. More rigorous oversight and guidance could have helped ensure that these costs were included.

GAO also found a lack of good departmentwide visibility over the migration effort in terms of project costs and progress. For example, DOD has not been tracking key performance issues, such as cost savings resulting from migration or management and staff productivity improvements. Further, it does not have a complete picture of the costs of all migration projects and its scheduling information is inaccurate and unreliable. As a result, the Department has not provided its own department-level decisionmakers with information needed to manage the effort, and it has not provided the Congress with complete and accurate information on migration. Moreover, in the absence of good performance measures for migration, the Department has not been able to show whether the overall strategy has been successful or not.

Reforming DOD's Information Technology Investment Process Requires Effective Implementation of the Clinger-Cohen Act

Defense recognizes the need for a better information technology investment environment and has taken steps to implement the Clinger-Cohen Act of 1996. The Congress passed the act in an effort to put an end to poorly managed and wasteful information technology projects. Among other things, it requires agencies to adopt an investment process that provides for the continual identification, selection, control, life-cycle management, and evaluation of information technology projects. As a first step in implementing the act, the Secretary of Defense directed the ASD C3I, as the Department's Chief Information Officer, to take the lead in

implementing an investment process as well as a performance- and results-based management strategy for information technology.

This is an important move toward bringing meaningful change to the current decision-making and oversight environment for migration. However, the current structure of the CIO position in the Department seriously limits the CIO's ability to effectively serve as a bridge between top management, line management, and information management support officials and to identify opportunities to use information technology to enhance performance. At present, the ASD C3I also serves as the Department's CIO. Asking the same individual to serve in both capacities prevents the CIO from devoting full attention to reforming information resources management within the Department. It also means that the ASD C3I will continue to be responsible for providing oversight for the same systems that he is responsible for selecting, developing, and implementing in his capacity as a PSA. This shortchanges much-needed independent oversight for about 45 percent of the Department's migration system investment.

Finally, effective implementation of the Clinger-Cohen Act will not occur unless Defense's information and system investment control processes successfully address the challenge posed by the prevailing organizational structure and culture found throughout the Department. This condition has promoted stovepipe systems solutions in each component agency and has made it difficult to implement departmentwide oversight or visibility over information resources. This same condition has contributed to the difficulty that has limited the Department in modernizing business processes and implementing corporate information systems across service and agency lines. This is most evident in the perceived failure of the CIM initiative, which was intended to reengineer business processes throughout the Department. By doing so, the Department expected to save billions by having more efficient, effective business processes running across service and component lines. However, these benefits have yet to be widely achieved after 8 years of effort. Without the Secretary's strong and continued support for management processes and controls designed to improve information management initiatives, Clinger-Cohen implementation could well suffer similar results.

Recommendations

To ensure that continued investment in migration systems provides measurable improvements in mission-related and administrative processes, GAO is recommending that the Secretary of Defense require

Defense components to rank development/modernization systems justifications and complete them on an expedited basis. GAO is further recommending that the Chief Information Officer certify that these justifications include the following:

- An analysis of operational alternatives that clearly demonstrate that continuing with migration is the best solution for improving performance and reducing costs in the functional area.
- An economic analysis showing a return on investment or other mission benefits that justify further investment.
- Documentation showing that the system currently complies with applicable Defense technical standards and uses standard data.

GAO's recommendations are also aimed at (1) correcting weaknesses within the current life-cycle management environment and (2) ensuring the successful reengineering of processes and implementing of corporate information systems for functional areas.

Agency Comments

The Acting Assistant Secretary of Defense for Command, Control, Communications and Intelligence provided written comments on a draft of this report. Defense concurred with five recommendations and partially concurred with two recommendations. Defense did not concur with the remaining five recommendations and expressed concerns about certain aspects of the report. Generally, the Department concurred with GAO's recommendations that it revise or develop internal policies and procedures to conform to the Clinger-Cohen Act, develop and implement performance measures, and improve the performance of internal tracking systems.

The Department did not agree to a proposal in the draft report that it limit further investments in ongoing migration systems to those that meet critical needs until they are independently determined to be economically, functionally, and technically justified. Defense believed that such a limitation would not only adversely affect military readiness, system development, and contract obligations, but also increase system obsolescence. GAO understands DOD's concerns regarding readiness and contract obligations. That is why the recommendation in the draft report recognized that critical needs still need to be met. GAO's point is that greater management attention needs to be placed on the migration decision-making process for approving and funding the development and modernization of migration systems to achieve intended benefits and

minimize unnecessary costs. In order to better clarify this position, GAO reworded its recommendation to focus on strengthening the controls for the decision-making process so that these investments can be better considered in the Department's budget process.

Defense also did not concur with a proposal in the draft report that it consider separating the CIO and the ASD C3I positions so that CIO can devote full attention to departmentwide information resource management issues and provide independent oversight. It noted, however, that all ASD C3I functions are being reviewed by the Department's Task Force on Defense Reform as part of its review of the Office of the Secretary of Defense's organizational structure. GAO withdrew the proposal because DOD is now considering this matter. Nevertheless, the concern that the current structure of the CIO position does not allow the CIO to devote full attention to critical IRM issues—such as computer security, the Year 2000 problem, and the need to develop and implement an integrated information technology architecture—remains valid.

Defense also stated that the report negatively portrays Defense's efforts to streamline its acquisition processes. GAO disagrees. Acquisition streamlining allows the Department to greatly simplify its acquisition processes for information technology purchases. However, acquisition streamlining was not intended to excuse DOD from exercising management controls to ensure that those purchases and related system development efforts made good business sense. Clinger-Cohen implementation should allow the Department an opportunity to develop more appropriate controls.

Defense's comments are discussed in chapter 4 and reprinted in appendix I.

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Abbreviations

ASD C3I	Assistant Secretary of Defense for Command, Control, Communications and Intelligence
CIO	Chief Information Officer
CIM	Corporate Information Management initiative
DOD	Department of Defense
DAB	Defense Acquisition Board
DII COE	Defense Information Infrastructure Common Operating Environment
DISA	Defense Information Systems Agency
DIST	Defense Integration Support Tools
FY	fiscal year
IRM	information resources management
JTA	Joint Technical Architecture
MAISRC	Major Automated Information System Review Council
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
PSA	Principal Staff Assistant
PA&E	Program Analysis and Evaluation
SFFAS	Statements of Federal Financial Accounting Standards
STARS	Standard Accounting and Reporting System
TAFIM	Technical Architecture Framework for Information Management

Introduction

Background

The Department of Defense (DOD) began its Corporate Information Management initiative (CIM) in October 1989 to help meet the challenge of effectively managing its diverse operations as it downsized its forces and activities. At the time, the Department believed that the thousands of systems and numerous administrative and mission-related processes¹ supporting DOD functions were redundant and inefficient and that they should be standardized and made more efficient. To address these problems, Defense planned to

- simplify and improve business processes;
- centralize responsibility and authority in functional areas, such as finance, personnel, communications, health affairs, logistics, command and control, and intelligence; and
- develop an integrated communications and data processing infrastructure based on departmentwide standards.

From the outset, DOD recognized that implementing CIM would be difficult because the basic tenet of the initiative—managing and implementing business improvements and building corporate systems along functional lines—represented a major shift in the way Defense traditionally did business. Whereas each military and Defense agency had historically managed its own business functions and information systems, CIM called on senior functional officials, known as Principal Staff Assistants (PSAs),² together with their Defense component counterparts to be responsible for implementing improvements and information systems within the Department's business functions across service and agency lines.

As CIM was implemented, Defense emphasized two ways of achieving process improvements and addressing problems associated with its disparate and stovepiped information technology environment.³ The first was to improve, or reengineer, business processes first and then apply technology to the new processes. The second involved selecting the best

¹Also known as business processes.

²PSAs are the Under Secretaries of Defense, the Director of Defense Research and Engineering, the Assistant Secretaries of Defense, the Director of Operational Test and Evaluation, the General Counsel of DOD, the Inspector General, the Assistants to the Secretary of Defense and the Office of the Secretary of Defense (OSD) Directors or equivalents who report directly to the Secretary or the Deputy Secretary of Defense. In essence, they are top executives at the department level who, together with their Defense component counterparts, are charged with developing corporate systems and reengineering business processes within their respective functional areas.

³The CIM initiative included several aspects, such as (1) corporate policy/planning, (2) process and data modeling, (3) process improvement, (4) performance measurement, (5) standard information systems, and (6) computing and communications infrastructure. DOD considered all the aspects of CIM to be important to effectively field information systems that support its mission.

DOD information systems from pools of existing, or legacy, systems that provide similar automated support services and eventually replacing the duplicative systems with the best systems. A few years into the CIM effort, this became known as migration.⁴ Defense believed that if done properly, migration could cut costs associated with developing and maintaining disparate systems supporting the same functions. It also believed that migration would help to standardize business processes and allow Defense to achieve savings that could be put to better use in advancing warfighting capabilities. Figure 1.1 illustrates how migration would work in one functional area.

⁴In DOD, migration can also involve developing or acquiring a new system, rather than choosing from existing systems. However, most migration efforts have involved choosing from existing systems.

Figure 1.1: An Example of Migration in Practice

For its finance and accounting functions, Defense's goal is to reduce the number of systems from the 324 that the services and agencies operated in 1991 to 32 systems.

As of the end of fiscal year 1996, the Defense Finance and Accounting Service's strategic plan stated it had reduced the number of finance and accounting systems to 217.

The migration strategy for accounting and finance is to

- (1) identify a single migration system for each of the Department's finance and accounting functions, such as civilian pay,
- (2) standardize the procedures and practices used to perform these functions, and
- (3) migrate from existing service-unique systems to the migration systems.

For some of these functions, such as general fund accounting, Defense established a two-pronged approach:

- (1) migrate initially to a single interim system or set of systems within each service and
- (2) migrate from the service systems to a departmentwide system or set of systems.

Migration Has Become the Focal Point for CIM

While Defense began CIM emphasizing the need to improve, or reengineer, processes before applying technology, it ended up placing more priority on obtaining quick savings through an accelerated migration strategy, which began in October 1993. This strategy called for selection of migration systems in 6 months and departmentwide transition to selected systems in the following 3 years. Defense believed that setting tight time frames for migration with some potential slippage would allow it to "harvest the

low-hanging fruit” of potential savings before reengineering. By default, this meant that the increased emphasis on migration would postpone the dramatic gains that could be achieved through reengineering.⁵

The risks involved with postponing reengineering efforts were significant. Reengineering identifies, analyzes, and redesigns an organization’s core business processes, aiming to achieve dramatic improvements in critical areas of performance, such as cost, quality, service, and speed. It focuses on redesigning the business process as a whole in order to achieve the greatest possible benefits to an organization and its customers. Migration, on the other hand, focuses on standardizing existing processes and information systems. This can yield some benefits, such as reducing the need to maintain disparate systems that support the same functions, but seldom yields dramatic improvements. In addition, if the process is inefficient or outmoded, migration only serves to perpetuate a bad process. Finally, choosing migration before reengineering may cause future reengineering efforts to be more difficult by entrenching inefficient and ineffective work processes.

We raised these concerns both before⁶ and after⁷ Defense decided to embark on the accelerated migration strategy. We believed that the shift in emphasis toward migration seriously endangered CIM’s chances for success. For this reason, and because CIM-related technology investments, which are expected to total billions of dollars each year, are vulnerable to waste and mismanagement, we designated CIM as a high-risk government information technology initiative.⁸ Nevertheless, Defense proceeded to concentrate on migration even in areas where it had recognized that there was a significant need to change business processes. One such area was transportation. We reported in 1996 that even though Defense recognized that its military transportation processes were fragmented, outdated,

⁵In an October 1993 memorandum, the Deputy Secretary of Defense announced a near-term strategy that focused on migration and data standardization. The memorandum stated that completion of other initiatives were not to be prerequisites of implementation of migration systems and data standards. While some functional areas may have continued process reengineering initiatives, our work indicates that many others gave priority to the migration strategy.

⁶Defense ADP: Corporate Information Management Must Overcome Major Problems (GAO/IMTEC-92-77, September 14, 1992).

⁷Defense Management: Stronger Support Needed for Corporate Information Management Initiative to Succeed (GAO/AIMD/NSIAD-94-101, April 12, 1994) and Defense Management: Impediments Jeopardize Logistics Corporate Information Management (GAO/NSIAD-95-28, October 21, 1994).

⁸Our high-risk effort, which began in 1990, identifies those federal program areas we consider high risk because they are especially vulnerable to waste, fraud, abuse, and mismanagement. See High-Risk Series: Information Management and Technology (GAO/HR-97-9, February 1997) and High-Risk Series: An Overview (GAO/HR-95-1, February 1995) for a discussion on CIM.

inefficient, and costly, it focused on technology solutions rather than the need to identify and correct the root causes of its transportation problems.⁹

Because reengineering took a backseat to migration in other business areas as well, CIM has never been able to achieve the level of cost savings and process improvements originally intended. A recent report¹⁰ conducted by RAND, a consulting organization, notes that "The CIM effort is today widely viewed as a failure in most quarters of the DOD. It has not resulted in either significant process reengineering or visible savings in the hardware and software required to support all the varied information systems in the Defense infrastructure."

Defense is still planning to invest at least \$18 billion in its migration effort from fiscal years 1995 through 2000. Because this investment is significant, we were asked for information on the status and progress of migration and whether Defense has significant controls in place to manage and oversee the effort.

Status of the Migration Effort

Defense reported that it has selected 363 systems for migration. Forty-nine of the 363¹¹ migration systems are large-scale, or major, systems¹² that are expected to cost at least \$13 billion—or about 72 percent of the total \$18 billion cost estimate—to develop, deploy, and maintain over fiscal years 1995 through 2000. Defense has identified 1,938 legacy systems for potential termination. As of April 1996, its Defense Integration Support Tools (DIST) database showed that 281 had already been terminated, 886 were scheduled for termination by the year 2000, and 771 more were identified for potential elimination after the year 2000.

Table 1.1 provides the number of systems selected by each functional area, the number of legacy systems identified for potential termination, and DOD's estimated costs of developing, deploying, and maintaining the migration systems. We excluded costs for 27 systems for which DOD

⁹Defense Transportation: Migration Systems Selected Without Adequate Analysis (GAO/AIMD-96-81, August 29, 1996).

¹⁰Strategic Appraisal 1997: Strategy and Defense Planning for the 21st Century, February 1997, RAND's Project Air Force; edited by Zalmay M. Khalilzad and David A. Ochmanek.

¹¹The numbers of migration systems selected and legacy systems identified for potential termination are subject to change as PSAs make additional selections and reevaluate previous ones. Also, the PSAs classified 138 of the 363 migration systems as interim systems.

¹²In DOD, major information systems projects are those that (1) have estimated program costs in excess of \$30 million in any 1 year, (2) have estimated program costs of over \$120 million in total, (3) have total life-cycle costs of over \$360 million, or (4) are designated as being of special interest. DOD periodically revises these dollar thresholds.

Chapter 1
Introduction

collected costs because the systems were classified. And costs for the remaining 121 of 363 systems were not included in the table because the Office of the ASD C3I had not collected the costs for these systems. Table 1.2 provides the name, status, and cost for each of the 49 major systems.

Table 1.1: Status Reported to GAO on Defense Migration Systems Selections and Costs

Dollars in millions

Functional area	Number of legacy systems identified for potential termination	Number of migration/ interim systems selected	Number of migration/ interim systems reporting costs	Total cost reported to GAO for fiscal years 1995 through 2000
Command and Control	67	35	34	4,493.2
Intelligence	304	69	46	572.6 ^a
Mission Support				
Atomic Energy	7	8	2	12.7
Communications	17	2	2	3,483.2
Environmental Security	286	11	6	33.1
Finance ^b	267	52	31	1,417.1
Health	62	55	49	2,533.8
Human Resources	198	20	10	933.1
Information Management	21	5	0	0.0
Inspector General	8	2	1	15.8
Logistics	496	63	53	4,459.1
Meteorology and Oceanography	33	33	0	0.0
Policy	3	7	7	73.9
Procurement	67	1	1	282.1
Science and Technology	102 ^c	0 ^c	0 ^c	^c
Total	1,938	363	242	\$18,309.7

Note: We did not independently verify information provided in this table.

^aCosts were not included for 27 systems for which DOD collected cost data because the systems were classified.

^bThe information presented for finance is not consistent with information presented in figure 1.1 of this chapter because the counts of systems occurred at different points in time.

^cThe science and technology functional area has not yet selected migration systems and has not specified which, if any, of its legacy systems may be terminated.

Source: Information obtained from the DIST, DOD's April 1996 Report to the Congress, discussions with Defense functional area managers, and the ASD C3I. Cost data were provided as of December 1996.

Table 1.2: Major Migration and Interim Systems/Applications Selected for Each Functional Area

Dollars in millions

System name		Acronym	Current milestone ^a	Total cost data reported to GAO for fiscal years 1995 through 2000
Systems being reviewed by the Defense Acquisition Board (six systems):				
Command and Control systems				
1	Advanced Field Artillery Tactical Data System	AFATDS	3	\$ 320.6
2	Combat Service Support Control System	CSSCS	2	104.9
3	Forward Area Air Defense C2 Intelligence System	FAADC2I	3	216.4
4	Maneuver Control System	MCS	3	253.7
Intelligence systems				
5	All Source Analysis System	ASAS	3	347.9
6	Joint Service Imagery Processing System	JSIPS	2	^b
Systems being reviewed by the Major Automated Information System Review Council (43 systems):				
Command and Control systems				
1	Air Force Mission Support System	AFMSS	3	351.9
2	Army Global Command and Control System	AGCCS	3	254.6
3	Counter Narcotics Command Management Control System	CN/CMS	3	112.2
4	Global Command and Control System	GCCS	3	422.1
5	Naval Aviation Logistics Command Management Information System	NALCOMIS	3	93.5
6	Naval Tactical Command System - Afloat	NTCS-A	3	314.1
7	Operations Support System	OSS	3	174.1
8	Shipboard Non-Tactical ADP Program III	SNAP III	3	401.4
9	Strategic War Planning System	SWPS	3	343.4
10	Tactical Support Center	TSC	3	154.3
Intelligence systems				
11	Exploitation Support System	ESS	0	^b
12	High Performance Computing Modernization Program	HPCMP	2	^b
Mission support systems				
Communications				
13	Defense Information System Network	DISN	0	2,556.2
14	Defense Message System	DMS	2	927.0

(continued)

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Dollars in millions

	System name	Acronym	Current milestone ^a	Total cost data reported to GAO for fiscal years 1995 through 2000
Finance				
15	Defense Joint Military Pay System	DJMS	1/2	114.9
16	Defense Procurement Payment System	DPPS	1/2	68.5
17	Standard Accounting And Reporting System	STARS	2/3	263.7
Health				
18	Ambulatory Data System	ADS	3	90.3
19	Composite Health Care System	CHCS	3	785.6
20	Composite Health Care System II	CHCS II	0	1.4
21	Corporate Executive Information System	CEIS	0/1/2	18.2
Human resources				
22	Defense Civilian Personnel Data System	DCPDS	1	58.5
23	Defense Commissary Information System	DCIS	2	120.8
24	Defense Commissary Point of Sales System	POS	3	262.4
25	Joint Recruiting Information Support System	JRISS	0	207.0
26	Navy Standard Integrated Personnel System	NSIPS	0	^b
27	Reserve Component Automation System	RCAS	2/3	^b
28	Standard Installation/Division Personnel System - 3	SIDPERS-3	2	^b
Logistics				
29	Ammunition Management Standard System	AMSS	0	55.7
30	Command and Control Information Processing System	C2IPS	3	311.8
31	Defense Automatic Addressing System	DAAS	3	12.7
32	Defense Medical Logistics Standard Support System	DMLSS	2	129.0
33	Department of Army Movements Management System - Redesigned	DAMMS-R	3	43.9
34	Depot Maintenance System	DMS	0 ^c	438.6
35	Distribution Standard System	DSS	3	270.2
36	Global Transportation Network	GTN	2	179.5
37	Joint Computer-Aided Acquisition and Logistics System	JCALs	2	789.0
38	Joint Engineering Data Management Information and Control System	JEDMICS	3	243.7

(continued)

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Introduction

Dollars in millions

	System name	Acronym	Current milestone^a	Total cost data reported to GAO for fiscal years 1995 through 2000
39	Materiel Management System	MMS	0 ^c	1,149.2
40	Transportation Coordinators' Automated Information for Movement System II	TC-AIMS II	0	15.1
41	Transportation Operational Personal Property System	TOPS	3	95.4
Meteorology & Oceanography				
42	Primary Oceanographic Prediction System	POPS	3	^b
Procurement				
43	DOD Standard Procurement System	SPS	1	282.1
Total				\$13,355.5

Note: We did not verify the information provided in this table. As discussed in chapter 2, these costs may be inaccurate.

^aThere are four milestones in the major system acquisition review process. These are milestone 0—approval to conduct concept studies; milestone 1—approval to begin a new acquisition program; milestone 2—approval to enter engineering and manufacturing development; and milestone 3—approval to produce, field, or deploy the system. Multiple milestones may be shown for some projects because the projects' subsystems or applications are in different phases of the acquisition process.

^bThe Office of the ASD C3I did not collect costs for this system.

^cBoth of these programs were redirected and are no longer targeted to be standard migration systems.

Source: Information DOD reported to the Congress in April 1996 and to GAO in the course of this audit.

Objectives, Scope, and Methodology

We were asked (1) for information on the number and cost of systems designated for migration, the number of legacy systems already terminated or scheduled for termination, and savings resulting from terminations of legacy systems and (2) whether Defense's management control and oversight processes for migration systems are ensuring that the investments are economically sound and in compliance with Defense's technical and data standards.

To assess the status of Defense's overall migration strategy and obtain available information on the number and cost of systems designated for migration, the number of legacy systems already terminated and scheduled

for future termination, and savings resulting from terminations of legacy systems, we analyzed a Defense April 1996 report to the Congress containing information on the schedule, cost, and status of the migration systems. Defense prepared this report¹³ in response to a requirement in Section 366 of the National Defense Authorization Act for fiscal year 1996. We also obtained and analyzed a copy of the DIST database as of April 1996 that Defense used to develop the report to the Congress, as well as to provide its own senior managers information on migration system selections and legacy system terminations. Additionally, we reviewed—but did not independently verify—cost information that Defense reported to Congress as part of the April 1996 Section 366 report. We also interviewed senior DOD officials to determine if additional cost and performance information on migration systems existed at the Office of the Secretary of Defense (OSD) level.

We assessed the reliability of the data presented to the Congress in two ways. First, we identified missing and conflicting information in the April 1996 Section 366 report to the Congress and requested that the ASD C3I staff to clarify conflicting information. Second, we compared the data reported to the Congress for three functional activities (business areas)—Transportation, Civilian Personnel, and Clinical Health—against data provided to us by the functional area managers at these activities. We then established and analyzed a database containing schedule and available cost information for the migration and legacy systems and modified the database to reflect updated schedule, costs, and other descriptive data Defense provided to us during the course of the audit.

To assess Defense's management control and oversight processes for migration systems to determine whether the investments are economically justified and comply with Defense technical and data standards, we reviewed the department-level management and oversight processes for approving the PSAs' migration system selections and for overseeing major migration systems' acquisitions by the Major Automated Information System Review Council (MAISRC).¹⁴ Our review did not focus on the process by which the PSAs select, develop, and manage their migration systems.

¹³As noted in this chapter, this report did not include costs for 121 information systems.

¹⁴MAISRC provides acquisition oversight for information systems that (1) are anticipated to cost \$30 million or more a year, (2) have estimated program costs in excess of \$120 million, (3) have estimated life-cycle costs of more than \$360 million, or (4) are designated for review by the ASD C3I, who also chairs the MAISRC. MAISRC reviews such matters as whether a proposed system is being developed in accordance with Defense policies, procedures, and regulations and whether system managers took steps to minimize the cost of a new system.

Nor did we examine acquisition review processes within the individual functional areas employed for nonmajor system projects.

To analyze Defense's oversight processes for reviewing and approving the PSAS' migration system selections, we reviewed department-level approval of the PSAS' selections. We obtained a list of migration systems that PSAS had selected for their functional areas. We then visited the Office of the ASD C3I and the Defense Information Systems Agency (DISA) and reviewed the business case analysis documentation, technical analysis documentation, and other documentation provided to those offices for department-level approval of the PSA's migration and interim system selections. We also interviewed officials from the Office of the ASD C3I, DISA, and the offices of selected PSAS regarding the documentation supporting the selections.

To review Defense's acquisition oversight processes for major migration systems, we first identified the major migration systems, as defined by Defense regulations. We then obtained and analyzed the progress reports and other documentation provided to MAISRC for those systems. We also interviewed Defense representatives and officials responsible for information systems oversight in the Office of the ASD C3I and offices of DISA, the Defense Acquisition Board (DAB), MAISRC, and Program Analysis and Evaluation (PA&E). We also interviewed representatives of the program offices or oversight offices for selected systems for which oversight had been delegated by MAISRC. Through document reviews and interviews, we determined whether economic analyses for major migration systems had been independently reviewed and if so, whether the reviews had identified problems in the analyses. We also determined whether DOD guidance existed on preparing economic analyses for information systems. A GAO economist met with PA&E analysts, reviewed problems that were identified with economic analyses, and verified the validity of the problems reported.

Additionally, we determined whether MAISRC had information on alternative analyses performed for major migration system selections. Lastly, we determined whether MAISRC has sufficient oversight information to ensure that major migration systems are complying with applicable technical and data standards that are necessary to achieve an interoperable systems environment.

We reviewed Defense's policies and guidance for migration systems to ensure that information technology is acquired, managed, and used in the most efficient and effective manner. Our assessment included analyzing

the National Defense Authorization Acts, Committee reports, and Conference reports for fiscal years 1993 through 1997; Defense Office of Inspector General reports; our prior studies of CIM and the migration system strategy, other available evaluations of the CIM and the migration strategy, and existing legislation affecting these efforts. The major studies reviewed included studies by RAND and the Defense Science Board.¹⁵ Pertinent existing legislation includes the Clinger-Cohen Act, the Government Performance and Results Act, the Paperwork Reduction Act, and the Chief Financial Officers Act.

We conducted our review from August 1996 through July 1997 in accordance with generally accepted government auditing standards. We requested comments on a draft of this report from the Department of Defense. The Acting Secretary for Command, Control, Communications and Intelligence provided us with written comments. These comments are discussed in chapter 4 and reprinted in appendix I.

¹⁵Achieving an Innovative Support Structure for 21st Century Military Superiority: Higher Performance at Lower Costs, 1996 Summer Study, Defense Science Board, Department of Defense. The Defense Science Board is a Federal Advisory Committee established to provide independent advice to the Secretary of Defense. Statements, opinions, conclusions, and recommendations in their reports do not necessarily represent the official position of DOD.

Management Control Processes Over Individual Migration Efforts Have Broken Down

Embarking on the migration strategy was an extremely risky endeavor for the Department of Defense. First, in developing standard systems within functional areas, the Department had to carefully consider complex technical issues, such as interfacing migration systems with other systems and contending with nonstandard data formats and definitions. For Defense, such complexities were compounded by its sheer size and the numbers of disparate systems. We believe an even tougher obstacle facing Defense, however, was the prevailing culture, which was based on decentralized department organizational structure, nonstandard processes and procedures. In general, each military service and Defense agency has historically managed its own business functions and information technology projects, whereas CIM and migration required business improvements and information systems to be managed on a Departmentwide, or corporate basis.

Therefore, to ensure the strategy's success, it was vital for Defense to establish an effective decision-making and oversight environment for making migration investments. It would need controls and processes that ensured inefficient administrative and mission-related work processes were modernized before significant technology investments were made to support them. It would also need controls that ensured that the migration projects themselves were effectively managed as investments so that the Department could target resources and attention to priority areas and stop those projects that failed to meet their goals. Finally, Defense needed life cycle management controls that ensured, on a system-by-system basis, that sound management and development practices were followed.

However, Defense's primary corporate-level control mechanism for ensuring that sound management and development practices were followed for each migration investment has not been effective. This control requires that all selections to be submitted for approval by the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (ASD C3I), who is also the Department's Chief Information Officer (CIO). In approving the systems, the Assistant Secretary is to review data, technical, and programmatic factors relating to the selection. We found, however, that most migration selections never came in for this approval and those that did were approved in the absence of critical technical and programmatic supporting documents. (A description of the migration decision process is provided in appendix II.)

Because this control was playing a marginal role in ensuring the success of migration, we assessed whether Defense's acquisition oversight

processes—which are designed to augment management oversight for the Department’s most expensive information systems—were helping to ensure that the major migration investments were economically and technically sound. These processes have also broken down where migration is concerned. Had there been more rigorous attention to oversight in both areas, Defense may well have avoided the migration problems we identified in previous reviews that cost the Department hundreds of millions of dollars.

In implementing the migration strategy, Defense did not ensure that it had adequate visibility over status, costs, and progress. As a result, it has not been able to (1) demonstrate whether the migration strategy has been successful, (2) provide the Congress with accurate and reliable information needed for oversight purposes, and (3) provide its own decisionmakers at the headquarters level with information needed to oversee the strategy.

Most Systems Not Approved by Defense’s Senior Technology Manager

After selecting a migration system, the Principal Staff Assistant (PSA)¹ responsible for a functional area is to submit the system for approval by the Assistant Secretary of Defense for Command, Control, Communications and Intelligence—the Senior Information Management Official and Chief Information Officer in DOD. In his memorandum² setting forth the requirements for selecting and reviewing migration systems, the ASD C3I stated that in approving the selections, he would consider data, technical, and programmatic factors. For example, the ASD C3I review would include such issues as whether the migration systems will lend themselves to data sharing and whether they conform to DOD’s technical standards—which act as a set of “building codes” for constructing systems to ensure they will be compatible with its information infrastructure and

¹The PSA is the senior executive-level manager who is responsible for the management of a defined function or functions within DOD.

²Requirements for selecting and reviewing migration systems under DOD’s accelerated migration strategy are described in two memorandums. The first memorandum was issued by the Deputy Secretary of Defense in October 1993, and the second was issued by the Assistant Secretary of Defense for Command, Control, Communications and Intelligence in November 1993.

technically interoperable with each other.³ This approval is important because, as the Department's Chief Information Officer, the Assistant Secretary needs to ensure that the migration systems help facilitate the sharing of information across service and agency lines.

However, both the PSAs and the ASD C3I did not adhere to this oversight process. First, 245 selections, or about 67 percent, were never submitted for this oversight even though all 363 system selections should have been.^{4, 5} Of the 49 major, or large scale, migration systems, only 16 were submitted for this review. Thus, for the bulk of migration systems, the Assistant Secretary was unable to ensure that Defense technical standards would be met and that the best system development practices were being followed.

Second, most of the systems that were submitted for this review were approved in the absence of critical technical and programmatic business case support. For example, 23 of the 118 selections that were submitted for this oversight, about 19 percent, were approved without documents stating that the functional area complied or planned to comply with technical standards. In addition, 64 of the 118 selections, about 54 percent, were approved without documents showing that the PSA responsible for the functional area performed some type of functional economic analysis or other similar business case analysis. This analysis is the means by which Defense managers are supposed to evaluate different options for improving business areas, such as outsourcing, reengineering, or migration. Because all of the migration selections submitted for this

³Defense's technical and data standards are designed to enable systems to easily interoperate and transfer information. Its standard definitions for data elements are intended to ensure that users of all Defense systems define the same data in the same way and have a common understanding of their meaning. Defense has developed or is in the process of defining technical standards in the Technical Architecture Framework for Information Management (TAFIM), the Joint Technical Architecture (JTA), and the Defense Information Infrastructure Common Operating Environment (DII COE). The Defense Information Systems Agency (DISA) is responsible for developing, obtaining from commercial sources, and maintaining the compilation of Defense Information Infrastructure technical standards, and it is responsible for maintaining a Defense data dictionary system as a repository of data requirements and for facilitating the cross-functional coordination and approval of standard formats, definitions, etc. PSAs, the military services, Defense agencies, and Joint Chiefs of Staff are responsible for reaching agreement on the standards and approving them as DOD standard data elements. DISA is then responsible for disseminating the approved standard data elements for use throughout the Department.

⁴Nine of the systems that were submitted for approval were grandfathered into approval because development for them was well underway at the time the accelerated migration system strategy began in 1993.

⁵Forty-two of the systems that were approved by the ASD C3I as migration systems did not follow DOD's migration system approval process described in appendix II. Instead, the ASD C3I approved these 42 Command and Control systems based on reviews by the Military Communications Electronics Board.

oversight have been approved—whether adequately supported by technical and business case justification or not—the ASD C3I oversight has essentially become a meaningless process.

Acquisition Oversight Process Did Not Ensure System Selections Were Economically and Technically Sound

Because the ASD C3I oversight control over the migration strategy played a marginal role in ensuring that sound management and development practices are followed, we assessed whether Defense's traditional major information systems acquisition oversight processes were doing so for 43 of the major migration systems.⁶ These review processes are designed to assess whether projects are affordable and financial and operational risks have been minimized.

Once under acquisition oversight, systems are normally reviewed and approved at each of four milestones.⁷ The reviews involve assessing such matters as whether the proposed system is being developed in accordance with Defense policies, procedures, and regulations; whether the systems' program managers took steps to minimize the cost of a new system by ensuring full and open competition; and whether the program managers will effectively use advanced system design and software engineering technology to minimize software and maintenance costs.

However, these reviews have not been effective for the migration effort. As discussed in the following section, MAISRC could not provide sufficient assurance that the major migration systems are economically justified and comply with Defense's technical and data standards.

Ineffective Review and Preparation of Economic Analyses

A principal tool of acquisition oversight is the economic analysis because it helps to ensure that the system chosen for development is cost-effective. If done properly, it can enable reviewers to determine whether DOD has

⁶As noted earlier, there are 49 major migration systems. Six of these are under the oversight of the Defense Acquisition Board (DAB). This is Defense's senior-level forum for advising the Under Secretary of Defense (Acquisition and Technology) on critical decisions concerning major weapon systems and large-scale information systems, principally in the communication, command, control, and intelligence functional areas. Criteria for DAB oversight are (1) estimated expenditures for research, development, test, and evaluation of more than \$355 million or (2) estimated procurement costs of more than \$2.135 billion. One difference between the DAB and MAISRC oversight processes is that systems reviewed by DAB are required to have independent cost estimates rather than economic analyses. According to the DAB analyst responsible for coordinating oversight of these systems, Program Analysis and Evaluation (PA&E) analysts performed independent cost estimates for all six migration systems under DAB oversight.

⁷The four milestones are: milestone 0, approval to conduct concept studies; milestone 1, approval to begin a new acquisition program; milestone 2, approval to enter engineering and manufacturing development; and milestone 3, approval to produce, field, or deploy the system.

sufficient funds in its budget to pay for the system, that is, whether the system is affordable. It can also reveal potential conflicts between available funding and the planned schedule for deployments. To arrive at these conclusions, the economic analysis establishes baseline life-cycle costs and benefit estimates for the project and calculates the project's return on investment.

The importance of developing complete and accurate economic analyses is underscored by several governmentwide requirements. For example, the Office of Management and Budget's (OMB) Circular A-130, Management of Federal Information Resources, calls on agencies "to conduct benefit-cost analyses to support ongoing management oversight processes that maximize return on investment and minimize financial and operational risks for investments in major information systems on an agencywide basis." Likewise, OMB's Circular A-11, Part 3, Planning Budgeting and Acquisition of Fixed Assets, (July 16, 1996), and its Bulletin No. 95-03, Planning and Budgeting for the Acquisition of Fixed Assets, state that "the planning for fixed asset acquisitions should be based on a systematic analysis of expected benefits and costs."

However, even though economic analyses play a critical role in assessing whether system development efforts will be cost-effective and beneficial, Defense has not yet established a set of minimum standards that an economic analysis must meet to be considered valid. In addition, it has not published official guidance for preparing an economic analysis. PA&E developed and published an unofficial economic analysis guide that recommended, but did not require, standard methods and formats for preparing an economic analysis for an information system development/modernization project. According to a PA&E representative, this unofficial guide is no longer adequate because it does not require the degree of standardization in methodology and analytic techniques needed to support a portfolio management approach for managing information technology investments, as required by the Clinger-Cohen Act of 1996. For example, the guide does not require that returns on investment for systems development/modernization projects be calculated in a standard manner using a standard definition. This lack of standardization results in economic analyses for different systems that are not comparable enough for DOD managers to have a good basis for deciding which systems offer the highest payoffs. The PA&E official stated that in conjunction with DOD's implementation of a portfolio management approach, it plans to officially publish appropriate documents and provide minimum standards and guidance for the economic analyses process.

Our review also found that DOD decisionmakers do not view economic analyses as key tools for deciding whether to invest in an information system development or modernization project. As a result, DOD often lacks complete and accurate information on system development/modernization projects' estimated costs and benefits at the time decisions are made to invest in the projects. Specifically, as the following examples show, we found that (1) economic analyses for many systems have not been submitted for independent review and (2) a significant portion of those that were submitted were inadequately prepared. Thus, many of the benefits that could be derived from this tool have not been realized.

- Twelve of the 43 major migration systems have not yet submitted an economic analysis, or an update of a previously prepared economic analysis, for independent review.⁸ These systems were under development or modernization and DOD had invested hundreds of millions of dollars in them in total. These included 5 systems that were under direct MAISRC oversight and 7 systems for which MAISRC delegated oversight responsibility to a service or agency. These 12 systems, or components of them, are all in the second development phase or beyond.⁹ Delaying the preparation or updating of a previously prepared economic analysis to the later stages of development for these 12 systems defeats the purpose of the economic analysis, which is to demonstrate that a proposal to invest in a new system is valid *before* that investment is made.
- Four systems that were under direct MAISRC oversight, were in the first development phase—concept exploration—and were, therefore, not yet required by DOD's acquisition regulations to submit an economic analysis or an update of a previously prepared economic analysis for independent review. Although these four systems were technically in compliance with Defense's acquisition regulations, DOD had already made major investments in them without the benefit of knowing whether returns on investment are going to be acceptable.
- Even though Defense has not established standards for the required analyses, Program Analysis and Evaluation (PA&E) staff who review the economic analyses that are under direct MAISRC oversight told us that 10 of

⁸Of the 43 major migration systems under MAISRC review, 27 were under direct review by MAISRC and 16 were delegated to other Defense oversight organizations, with MAISRC retaining responsibility for ensuring adequate oversight.

⁹The responsibility for independently reviewing economic analyses for the five systems that were under direct MAISRC oversight rests with DOD's Program Analysis and Evaluation staff, while the responsibility for reviewing economic analyses for the seven delegated systems rests with the various Defense organizations to which MAISRC delegated oversight responsibility.

the 19 economic analyses reviewed had problems.¹⁰ These problems included the following:

- Understating or omitting the costs of standardizing data, implementing the standard data in the systems, and developing system interfaces.
- Failing to estimate the amount of savings expected for terminating duplicative legacy systems.
- Relying on professional judgment to make unsupported assumptions rather than making objective analyses to estimate the value of benefits and costs. For example, in one case, the economic analysis estimated a cost avoidance associated with replacing an old system by assuming that both the old and the replacement systems' software maintenance costs could be accurately estimated using two different rates per line of code, but the analysis provided no data supporting the validity of either rate.

After identifying problems with these 10 economic analyses, PA&E staff worked with MAISRC analysts and the systems' program managers to address the problems. However, DOD continued to develop the systems in spite of the fact that the investments had not been justified by complete and accurate economic analyses.

PA&E analysts told us that there were other problems that impeded their review and verification of the economic analyses. For example, economic analyses are often not updated and provided to PA&E for review after major changes occur in the project, such as significant cost growth or redirection of the project. A second problem is that economic analyses are often not supported by analyses of alternatives that weigh the cost and benefits of various technical options, such as whether to buy commercial off-the-shelf software or develop a system in-house.¹¹ This analysis would help Defense decisionmakers make sound decisions on whether the proposed alternatives offer sufficient military or economic benefits to be worth their cost, and to determine which alternative is the best approach. It would also identify alternatives that DOD may want to reconsider at a later time if the selected approach runs into difficulties.

¹⁰We did not identify concerns or problems with the economic analyses for the remaining 8 of the 43 major migration systems that were under direct MAISRC oversight for which MAISRC had delegated oversight responsibility to another DOD organization.

¹¹The analysis of technical alternatives would normally precede the economic analysis. In Defense, an economic analysis weighs the costs, benefits, and risks associated with maintaining the status quo versus the chosen technical solution.

**DOD's Acquisition
Oversight Organizations
Lack Assurance That Major
Systems Comply With
Technical and Data
Standards**

Defense has established several sets of standards that are designed to ensure that systems developed are compatible with its communications and computing infrastructure and that they are technically interoperable with each other. Some Defense leaders consider systems interoperability and the ability to exchange data across functional lines to be the most important consideration in migration system development, transcending economic benefits. These standards include the Technical Architecture Framework for Information Management (TAFIM), Defense Information Infrastructure Common Operating Environment (DII COE), and DOD standard data.¹² DOD system acquisition directives call on MAISRC and DAB to ensure that program managers comply with the Department's policies and procedures and use best practices in developing and modernizing individual information systems. These best practices include building systems and databases that comply with applicable technical standards and use DOD standard data.

However, MAISRC and DAB do not have adequate assurance that the major migration systems are complying with applicable technical standards¹³ and are using standard data. For example, out of 43 major systems under MAISRC oversight, program managers reported to MAISRC that (1) only 19 were in compliance with the TAFIM standards or had plans to comply with the TAFIM standards and (2) 9 systems were using DOD standard data or had plans to use standard data.¹⁴ We found similar results for compliance with DII COE standards. Specifically, program managers reported that only 25 systems were in compliance or had plans to be in compliance with DII COE. These self-reports by program managers are questionable because they are not independently verified.

In addition to obtaining information on technical and data standards directly from program managers, MAISRC and DAB also obtain such information from the Defense Information Systems Agency (DISA). DISA supports MAISRC and DAB oversight of major systems by performing technical reviews of system documentation to determine if it indicates that interoperability issues are being addressed or will be addressed as the

¹²See footnote 3 for more information on technical and data standards.

¹³All DOD technical standards may not apply to all systems and initiatives. For example, those standards that apply to application software and data would not apply to a system or initiative that included only computer equipment or hardware. To illustrate, Defense's High Performance Computing Modernization Program initiative largely involves the purchase of computer equipment and not the development of software. Therefore, application software-related standards may not apply.

¹⁴In addition, information available to DAB indicated that all six migration systems under DAB program managers have already prepared plans to bring their systems into compliance with DOD technical standards.

system is developed. According to a DISA representative, DISA reviewed system documentation that had been prepared for 37 of the 43 MAISRC migration systems and all 6 of the DAB systems and found that the documentation indicated interoperability issues were planned to be addressed for each of them.

DISA also provides feedback, advice, and assistance on interoperability and related issues during integrated product team meetings with MAISRC, DAB, and system program managers. During these meetings and on other occasions when it is asked to do so, DISA provides MAISRC and DAB general information on compliance with standards, such as whether the major systems' program managers have contacted DISA and appear to be making reasonable attempts to bring their systems into compliance with applicable standards. DISA also assists program managers in developing strategies and cost estimates for achieving compliance with standards.

However, DISA does not regularly report detailed information to MAISRC and DAB that would enable these oversight organizations to ensure that each major system is adequately complying with applicable technical and data standards.¹⁵ For example, DISA does not regularly report to MAISRC and DAB such detailed information as (1) each system's current compliance with applicable standards—that is, each system's current status relative to the eight levels that DOD has defined for the DII COE, and each system's number and percentage of data elements that have been approved as DOD data standards in the Defense Data Dictionary System, (2) whether each program office prepared sound strategies, schedules, and cost estimates for achieving compliance with applicable standards, (3) whether each system's compliance strategy and cost estimate were approved by DISA, (4) each system's current schedule and cost status for achieving compliance compared with its baseline schedule and cost estimate, and (5) whether each system has been independently certified by DISA's Joint Interoperability Testing Command to be in compliance with the technical and data standards. MAISRC analysts responsible for overseeing the major migration systems confirmed that they did not know many of the systems' current status regarding compliance with applicable technical standards and use of DOD standard data, or whether the program managers had

¹⁵A DISA representative stated that program managers are supposed to input data into DOD's DIST database that could be used by MAISRC and DAB to track each individual system's progress in complying with DII COE. For example, the representative noted that program managers are supposed to input compliance data into DIST, including (1) their systems' current level of compliance with DII COE, (2) information on their strategies for achieving compliance, and (3) the expected date and cost to achieve compliance. However, as discussed in appendix IV, our analysis of the data in the DIST database showed they are incomplete and inaccurate. Until DOD corrects these deficiencies, MAISRC and DAB cannot rely on DIST for tracking compliance with standards for individual systems.

developed and were following sound strategies for bringing the systems into compliance.

The technical and data standards are supposed to help pave the way to an interoperable systems environment. However, without complete and accurate data on individual systems' compliance with standards, MAISRC and DAB cannot assure Defense's Chief Information Officer that the Department's major information systems are complying with the standards. Without this information, as well as standards compliance information from the managers of DOD's nonmajor systems, the CIO cannot gauge the Department's progress toward achieving its goal of an interoperable systems environment. Additionally, this information is critical if the CIO is to successfully implement an integrated technical architecture for the Department as required by the Clinger-Cohen Act of 1996.

Better Oversight Could Have Helped to Prevent Problems Identified in Previous GAO Reviews

The lack of rigorous oversight for the migration strategy has increased the risk that Defense will pursue flawed system strategies. In fact, our previous reviews of migration systems identified a number of problems that could have been prevented had there been better oversight by MAISRC and the ASD C3I. For example, in several reviews, we found that functional areas did not account for various categories of significant costs when making their migration decisions. These findings are highlighted as follows.

- In reviewing the depot maintenance standard system migration effort, we found that Defense did not address the full costs of developing interfaces needed to allow system components to exchange data with information systems currently used by the services to accomplish their missions. One official estimated that this represented \$70 million in costs.¹⁶
- In analyzing what it would cost to develop its Standard Accounting and Reporting System (STARS), we reported that Defense neglected to consider internal project management costs and costs to enhance all of the STARS components to bring them into compliance with DOD's standard general ledger, key accounting requirements, and the standard budget and accounting classification code.¹⁷

¹⁶Defense Management: Selection of Depot Maintenance Standard System Not Based on Sufficient Analyses (GAO/AIMD-95-110, July 13, 1995).

¹⁷DOD Accounting Systems: Efforts to Improve System for Navy Need Overall Structure (GAO/AIMD-96-99, September 30, 1996).

- In reviewing the transportation migration effort, we found that Defense did not include all costs associated with its evaluation of in-house systems when analyzing costs and savings for its 28 migration systems. These included \$16 million for its analysis of candidate migration systems and \$2 million for maintaining migration system hardware. We also found that if these costs were included in its systems selection analyses, Defense would have found that the overall return on investment would have decreased and that it may actually lose money on its investment.¹⁸

In previous reviews, we also found that Defense functional areas did not adequately consider other alternatives to developing systems in-house. For example, while the transportation area reviewed commercial off-the-shelf transportation software projects for some transportation business areas, this review was inadequate because it did not (1) analyze the degree to which unmodified software could meet unique Defense requirements, (2) identify the expected cost to make necessary software modifications, (3) determine the time required to make the modifications, and (4) provide for a hands-on view of the software in operation. In addition, Defense concluded that software packages that could provide some degree of transportation functionality would require modifications that were too costly. However, Defense could not provide documented analysis to support this conclusion. Further, Defense planned on making \$13 million worth of software modifications to just five of its in-house selections. We believe better oversight by the CIO (then referred to as the Senior Information Management Official) may well have forced greater consideration of commercial packages in the transportation area.

Finally, our review¹⁹ of Defense's effort to develop a standard suite of migration systems for materiel management showed that the Department spent hundreds of millions of dollars without achieving the expected benefits because it did not adequately anticipate and mitigate risks. From 1992 to late 1995, Defense spent about \$714 million developing standard systems with minimal results. During that time, there were dramatic changes in the goals and expectations for the program and only one application was partially deployed. Because of changes in objectives and scheduling and problems in development, prospects for achieving the original objective of implementing a standard suite of integrated materiel management systems appeared dim.

¹⁸Defense Transportation: Migration Systems Selected Without Adequate Analysis (GAO/AIMD-96-81, August 29, 1996).

¹⁹Defense IRM: Critical Risks Facing New Materiel Management Strategy (GAO/AIMD-96-109, September 6, 1996).

In 1996, Defense finally abandoned its strategy to develop a standard suite of materiel management systems because of funding cuts, cost overruns, and schedule delays and embarked on a new strategy that involved individual deployment of nine system applications at selected sites as the applications were developed. However, the decision to drastically change the course of the strategy was initiated without first conducting critical economic and risk assessments that would estimate the costs, benefits, and risks of alternative strategies and having the analyses independently reviewed by MAISRC and PA&E.²⁰ The need for department-level review of analyses supporting this decision was important, given the fact that the new strategy represented a departure from Defense's goal of eliminating redundant legacy systems and varied business processes.²¹

Defense Lacks Visibility Over Migration Effort

A successful information technology investment process cannot operate without accurate, reliable, and up-to-date data on project costs, benefits, and risks. It is the basis for informed decision-making. However, in implementing the migration strategy, Defense neglected to provide visibility over progress and costs. The absence of reliable and accurate performance, cost, and schedule information on the migration effort has been debilitating in several respects. First, it has impaired the Department's ability to demonstrate whether the migration strategy has been successful. Second, it has kept Defense from providing the Congress²² with accurate and reliable information needed for oversight purposes. Third, it has prevented Defense from providing its own senior managers with information needed to oversee the migration effort.

Key Performance Issues Have Not Been Tracked

Since it embarked on the migration strategy, Defense has not tracked overall departmentwide savings or validated improvements to operations resulting from the migration strategy. In particular, it has not been systematically tracking such key performance issues as (1) administrative and operational cost savings resulting from elimination of redundant

²⁰The materiel management standard system was originally projected to cost \$5.3 billion to develop and deploy. The threshold for major information system projects is \$360 million in total life-cycle costs.

²¹Under the revised strategy, the military services would be allowed to keep their legacy systems longer than anticipated, and some legacy systems would not be shut down.

²²For example, Defense reported to the Congress that it had selected 363 migration and interim systems, using DIST as the source of the data. Defense also provided cost data that were collected by the Office of the ASD C3I based on a different list of 245 migration and interim systems. Since the ASD C3I's staff relied largely on an official list of 245 systems that ASD C3I issued in July 1995 to provide cost information to the Congress, that information was incomplete. In addition, the ASD C3I's staff did not reconcile the two lists of systems in its report to the Congress.

systems, (2) cost reductions resulting from improved information systems support to functional areas, (3) management or staff productivity improvements, and (4) benefits accruing to mission effectiveness that are attributable to information technology support. Having this type of information is the only means of ensuring that the billions of dollars being spent on the migration are producing sufficient returns and achieving departmentwide progress.²³ Without it, Defense cannot justify whether the migration strategy has been a worthwhile investment or support the need to continue pursuing migration.

At one point in the migration effort, as directed by the Congress,²⁴ Defense developed performance measures. However, it did not regularly collect data on all the measures, and the accuracy of much of the information it collected was questionable because of the data integrity problems plaguing the database Defense relies on for migration inventory and schedule-related information. In 1995, the House Committee on National Security directed Defense²⁵ to reevaluate its measures. In March of 1997, a Defense working group proposed a revised set of performance measures relating to migration systems and other information technology issues within the Department. However, senior Defense management did not approve the measures and instead tasked the working group to redo them to ensure that they are linked to the Department's strategic information technology management goals. The working group has not established a schedule for completing this effort and finalizing the measures.

Having performance measures will help to validate individual reports of migration successes, such as the migration systems characterized as successful in Defense's report to the Congress pursuant to Section 381 of the National Defense Authorization Act for Fiscal Year 1995. These are the Standard Procurement System, the Distribution Standard System, the Defense Civilian Personnel Data System, and the Defense Medical Logistics Standard Support System.

²³According to a DOD representative, the Department performed intense reviews of migration systems during the last three cycles of its planning, programming, and budgeting process. During these reviews, DOD asked program managers and other senior managers to provide performance information on their systems. However, the representative stated that the performance information provided was limited because DOD does not routinely track this information for its information systems.

²⁴National Defense Authorization Act for Fiscal Year 1995.

²⁵H. Rep. No. 104-131, p. 161.

**Cost Information Is
Incomplete and May Be
Significantly Understated**

We could not determine the full cost of the migration effort because Defense's migration cost information is incomplete and may be significantly understated. For example, when Defense provided migration cost data to us in December 1996, it could only provide costs for 242 of 363 migration systems. We did not include costs in this report for 27 of 242 systems for which DOD collected costs because the systems were classified. However, the remaining 121 systems were not included because the Office of the ASD C3I had not collected the costs for these systems. When we obtained cost information directly from three of the functional areas, we found that at least \$1.6 billion in costs had been excluded from the approximately \$18 billion total. This included about \$1.4 billion for clinical health systems, \$56 million for civilian personnel systems, and \$111 million for transportation systems.

We also found that the \$18 billion total cost estimate does not account for some very important costs related to developing, deploying, and maintaining migration systems both before and after a project has been initiated. For example, the transportation functional area has an office designated to oversee the development and deployment of its migration systems. But, when accounting for costs for the systems, DOD does not factor in the cost to maintain this oversight responsibility. In addition, our previous reviews of finance and logistics migration efforts have found that DOD did not account for costs for these projects relating to such activities as project management and developing interfaces with other systems. Our detailed analysis of DOD's migration cost information is provided in appendix III.

**Schedule Information Is
Unreliable**

We could not accurately determine how many legacy systems have been terminated and how many are scheduled for termination because the database Defense uses to track information systems is plagued with data integrity problems.

Defense's own analyses of the database have shown that it cannot readily provide simple descriptive information for many systems. For example, a February 1997 DOD analysis of DIST showed that 55 percent of the migration systems in the database had incomplete information on interfaces with other systems and 77 percent had incomplete data on installations where the systems operated.

Our analysis of DIST found that 61 percent the migration system implementation dates and 32 percent of legacy system termination dates

were questionable. In addition, when we compared DIST scheduling information to information maintained by three functional areas we reviewed, we found that most of the migration systems implementation dates and legacy system termination dates in DIST were incorrect. For example, DIST showed that 92 legacy systems were terminated by April 1996 in the clinical health, civilian personnel, and transportation areas, while functional area managers told us that only 43 had actually been terminated. Also, for the three functional areas, DIST showed that 53 legacy systems were scheduled for future termination while functional area managers told us that 91 were slated for future termination.

We also found that Defense has not ensured that the data definitions and formats used in DIST are fully compatible with data maintained in other Defense information systems that track and report on systems. While DOD is attempting to address this issue, DISA provided us information showing that only 66 of the 218 data elements contained in DIST have been approved as standard data elements in the Defense Data Dictionary System. Without standard definitions and data formats, data cannot be easily transferred to DIST from the other systems that may be used by functional area managers and other decisionmakers.

Defense officials acknowledge that DIST is incomplete and inaccurate, and the Department has begun efforts to make the database more accurate and more user friendly. However, Defense officials also stated that they still used DIST to generate reports to the Congress because it was the only departmentwide database containing schedule and other descriptive data on all Defense migration and legacy systems. A detailed analysis of DIST's integrity problems is provided in appendix IV.

Reforming DOD's Information Technology Investment Process Requires Effective Implementation of the Clinger-Cohen Act

Defense has begun implementing Division E of the Clinger-Cohen Act of 1996 (Public Law 104-106), which the Congress passed in an effort to put an end to problems associated with the development and implementation of government information systems—such as those evident in the migration effort. Under this legislation, Defense is required to establish additional controls to ensure that more attention is devoted to the selection, control, and evaluation of information technology projects and that the Department's technology investments are managed from a portfolio perspective.

Implementing the Clinger-Cohen Act in DOD can bring meaningful reform to the management of migration and other information technology investments. However, the current structure of the Chief Information Officer (CIO) position in the Department will not permit the CIO to devote full attention to reforming information resources management within DOD. And it will continue to impose responsibilities on the CIO that conflict with the CIO's obligation to provide independent oversight over the development and implementation of information systems.

The Clinger-Cohen Act

The Clinger-Cohen Act recognizes that the key to successfully managing information technology projects is ensuring that investment processes provide for the continued identification, selection, control, life-cycle management, and evaluation of information technology investments. Best practices on which the act is based have shown that to ensure an investment process is successful, top executives need to periodically assess all major projects—proposed, under development, and operational—then prioritize them and make funding decisions based on factors such as cost, risk, return on investment, and support of mission-related outcomes. Once projects are selected for funding, executives need to monitor them continually, taking quick actions to resolve development problems and mitigate risks. After a project is implemented, executives should evaluate actual versus expected results and revise their investment management process based on lessons learned.

As our guide, Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' Information Technology Investment Decision-making,¹ points out, a key to success in this type of management is considering all the major technology investments that are vying for funding at a designated level (departmental, functional area, or service/agency level) as a total

¹GAO/AIMD-10.1.13 February 1997, Version 1.

package, or *portfolio*, of possible technology investments. Once this perspective is adopted, an organization can focus scarce information technology resources on the projects with the greatest impact on mission and concentrate management attention on those high-impact projects that become troubled projects. It can also establish performance goals and stop or replace those systems or initiatives that fail to meet those goals.

This type of decision-making process can be applied to almost any organization, even one that is as highly decentralized as DOD. According to our investment guide, separate information technology investment decision-making processes can exist at various levels. In DOD, such processes could exist at the departmental level and the functional area or service/agency level, provided that the Department can identify which major projects and initiatives should be managed at each level. Criteria for determining projects that should be managed at the various levels may include the dollar amount of the investment, the degree of risk associated with the project, and whether the system is to be shared across functional area lines or service/agency lines.

The Clinger-Cohen Act contains the following additional requirements that are important for DOD to implement in order to address problems evident in its migration strategy.

- Agencies are to determine whether their administrative and mission-related business processes should be improved before investing in major information systems to support them.
- The investment process is to provide a means for senior management to obtain timely information regarding progress (at established milestones) in terms of cost, capability of the system to meet requirements, timeliness, and quality. It should also provide for the evaluation of the results of information technology investments.
- Performance measures are to be prescribed for information technology used by or to be acquired for the agency.
- The CIO is to monitor the performance of information technology programs; evaluate the performance of those programs on the basis of applicable performance measures; and advise the agency head regarding whether to continue, modify, or terminate the program or project.
- The CIO is to be responsible for providing advice and other assistance to agency heads and senior managers to ensure that information technology is acquired and information resources are managed for the agency in a manner that implements the policies and procedures of the act and the priorities of the agency head.

- The CIO is to develop, maintain, and facilitate the implementation of a sound and integrated information technology architecture for the agency. The architecture is an integrated framework for evolving or maintaining existing information technology and acquiring new information technology to achieve the agency's strategic and information resources management (IRM) goals.

DOD Implementation of the Clinger-Cohen Act

As a first step in implementing the Clinger-Cohen Act, on June 2, 1997, the Secretary of Defense outlined his expectations for improvements in information technology-related management processes and information resources.² We believe the expectations identified by the Secretary are an excellent starting point for implementing the Clinger-Cohen Act and bringing meaningful change to the current information technology management process. For example, the Secretary has called on the CIO to design and implement a process for maximizing the value and assessing and managing the risks of DOD information technology acquisitions. This process is to

- provide for the selection of information technology investments to be made by the Department, the management of such investments, and the evaluation of the results of such investments;
- be integrated with processes for making budget, financial, and program management decisions;
- include minimum criteria to be applied in considering whether to undertake a particular investment in information systems, including criteria related to the quantitatively expressed projected net, risk-adjusted return on investment, and specific quantitative and qualitative criteria for comparing and prioritizing alternative information system investment projects;
- identify, for each proposed investment, quantifiable measurements for determining the net benefits and risks of the investment; and
- provide the means for senior managers to be able to obtain timely information regarding the progress of an investment in an information system, including the milestones for measuring progress on an independently verifiable basis, in terms of cost, capability of the system to meet specified requirements, timeliness, and quality.

In addition, the Secretary has called on the CIO to institutionalize performance-based and results-based management for information

²Memorandum from the Secretary of Defense to the Secretaries of the Military Departments, Chairman of the Joint Chiefs of Staff, Under Secretaries of Defense, and others on the Implementation of Subdivision E of the Clinger-Cohen Act of 1996, dated June 2, 1997.

technology. In doing so, the CIO is to work with the Chief Financial Officer, the Principal Staff Assistants (PSAs), and the Defense components. The CIO is to establish goals for improving the efficiency and effectiveness of DOD operations and issue instructions to functional areas on performance measurements. The CIO is also to monitor the performance of information technology programs, evaluate the performance of those programs on the basis of applicable performance measurements, and advise the Secretary of Defense regarding whether to continue, modify, or terminate programs or projects. Additionally, the Secretary established a Chief Information Officer Council for DOD to serve as the principal forum for discussing improvements in DOD practices for the management of information technology.

In outlining his expectations, the Secretary noted that the act poses questions that should be answered before investing in information technology, including:

- What functions are we performing and are they consistent with the mission?
- If we should be performing particular functions, could they be performed more effectively and at lower cost by the private sector?

The Secretary further stated that if a function should indeed be performed by the Department, the law requires that the function be examined and redesigned or reengineered before applying new technology.

Challenges Confronting DOD in Implementing Clinger-Cohen

Proper implementation of the Clinger-Cohen Act would help to address a number of weaknesses that are currently standing in the way of Defense's ability to provide a good decision-making and oversight environment for information technology projects. For example, with full implementation of the act, Defense could begin considering information technology investments as a total package of possible projects so that it can target resources to those projects having the greatest impact on mission and concentrate management attention on troubled areas. It could also strengthen visibility over project performance, costs, and schedules so that senior managers can begin comparing the results being achieved against projected, costs, benefits, and risks and to identify actual or potential managerial, organizational, or technical problems.

Moreover, in implementing the act, Defense has an opportunity to (1) begin enforcing compliance with data and technical standards to

ensure that DOD's goals for interoperability and the sharing of information are met and (2) increase oversight for functional area assessments of whether to reengineer, migrate, or undertake some other path toward improvement.

However, the current structure of the CIO position in Defense will not permit the CIO to effectively serve as a bridge between top management, line management, and information management support officials and identify opportunities to use information technology to enhance performance.

The Clinger-Cohen Act requires that information resources management be the CIO's primary responsibility and that the CIO be involved in key decisions regarding the application of information technology in support of the agency's missions. Currently, the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (ASD C3I) also acts as the CIO. By asking the CIO to also shoulder a heavy load of programmatic responsibility, Defense has made it difficult, if not impossible, for the CIO to devote full attention to IRM issues. These issues go well beyond the development and modernization of information systems.

For example, Defense needs its CIO to be heavily involved with implementing a more aggressive and proactive computer security program. As we reported in May 1996,³ attackers have seized control of entire Defense systems, many of which support critical functions, such as weapons systems research and development, logistics, and finance. Attackers have also stolen, modified, and destroyed data and software. In addition, Defense needs its CIO to help ensure that Year 2000⁴ corrections are made to all of DOD's information systems. If systems are not corrected on time, the impact on Defense operations could be widespread, costly, and debilitating to important warfighting and administrative operations. While DOD has delegated year 2000 responsibility to its components, it still needs to ensure, at the department level, that sufficient priority and

³Information Security: Computer Attacks at Department of Defense Pose Increasing Risks (GAO/AIMD-96-84, May 22, 1996).

⁴The Year 2000 problem is rooted in the way dates are recorded and computed in automated information systems. For the past several decades, systems have typically used two digits to represent the year in order to conserve on electronic data storage and reduce operating costs. With this two-digit format, however, the year 2000 is indistinguishable from 1900, 2001 from 1901, etc. As a result of this ambiguity, system or application programs that use dates to perform calculations, comparisons, or sorting may generate incorrect results when working with years after 1999.

resources are being devoted to the problem and that all systems have been identified and corrected.⁵

There is also a direct conflict of responsibilities between the oversight and programmatic obligations associated with the two positions. The ASD C3I serves as the Principal Staff Assistant for command, control, communications, and intelligence systems. These systems represent about 45 percent of the migration system investment—about \$8.5 billion of the total \$18 billion migration investment. This poses a conflict for both control mechanisms we assessed. For the first control—the ASD C3I approval process—the same individual is responsible for both selecting a system and approving the selection. For the second control—acquisition oversight—Defense's Acquisition Executive is also responsible for developing 14 of the 43 major automated information systems under the Major Automated Information System Review Council (MAISRC).⁶

A second challenge confronting DOD in implementing the Clinger-Cohen Act is the prevailing organizational structure and embedded culture found throughout the Department. Specifically, the three military services have clearly defined roles and responsibilities and separate budget authority, program execution, and functional authority for the enforcement of national defense policy and objectives. As we have reported⁷ throughout the CIM initiative, this environment has promoted stovepipe systems solutions in each component agency and has made it difficult to implement departmentwide oversight or visibility over information resources. This same condition has contributed to the difficulty that has limited the Department in modernizing business processes and implementing corporate information systems across service and agency lines. This is most evident in the perceived failure of the Corporate Information Management initiative (CIM), which was intended to reengineer business processes throughout the Department. In doing so, the Department expected to save billions by having more efficient, effective business processes running across service and component lines. However, these benefits have yet to be widely achieved after 8 years of

⁵We have been assessing Year 2000 efforts at DOD and have issued reports on Year 2000 work at individual DOD components. We also plan to report on DOD's overall response to the Year 2000 issue.

⁶As the Department's CIO, the ASD C3I is the Acquisition Executive for DOD's major information systems. In this capacity, the staff who oversee major information systems acquisition for MAISRC report to the ASD C3I.

⁷Defense ADP: Corporate Information Management Initiative Faces Significant Challenges (GAO/IMTEC-91-35, April 22, 1991); Defense ADP: Corporate Information Management Initiative Must Overcome Major Problems (GAO/IMTEC-92-77 September 14, 1992); and Defense Management: Stronger Support Needed for Corporate Information Management Initiative to Succeed (GAO/AIMD/NSIAD-94-101, April 12, 1994).

Chapter 3
Reforming DOD's Information Technology
Investment Process Requires Effective
Implementation of the Clinger-Cohen Act

effort. Without the Secretary's strong and continued support for management processes and controls designed to improve information management initiatives, Clinger-Cohen Act implementation could well suffer similar results.

Conclusions, Recommendations, and Agency Comments

In taking its initial steps to implement the Clinger-Cohen Act, Defense has recognized that it needs a better information technology investment environment. However, implementing the act will not be easy given weaknesses pervading the current decision-making and oversight environment. Examples included the following:

- DOD's management and oversight processes over information technology projects are not effectively integrated to enable the Department to manage from a portfolio perspective. Considering investments as a total package of possible projects is important because it forces an agency to decide which projects are the most critical to meeting mission needs and thus should receive the most resources and attention. Life-cycle management controls that provide oversight on a system-by-system basis can supplement and enhance this process, but they cannot be a substitute for it.
- DOD still has not established information technology performance measures. These need to be in place before a new investment process can begin so that senior managers can begin comparing results being achieved against projected costs, benefits, and risks.
- As far as visibility over costs and schedule are concerned, DOD has fragments of a mechanism for collecting and maintaining all project information. However this mechanism—DIST—does not maintain cost information and its accuracy and reliability are questionable. Further, as we have recently reported to the Director of the Defense Information Systems Agency,¹ efforts to improve the DIST have been slow-moving.
- While the Clinger-Cohen Act requires agencies to conduct post-implementation reviews, DOD's oversight processes have concentrated on projects prior to their implementation. Thus, in addition to focusing on the pre-implementation stages of system life-cycles, DOD will have to ensure that more attention is given to whether implemented systems are achieving the forecasted benefits and continuing to meet mission needs after they are implemented.
- Currently, DOD does not have an effective mechanism in place to ensure that the CIO has complete and accurate information on DOD-wide compliance with technical and data standards. Such a mechanism is

¹We recently reported in *Defense Computers: DOD's Inventory of Automated Information Systems Needs to Be Improved to Successfully Address Year 2000 Problems* (GAO/AIMD-97-112, August 13, 1997) that Defense is planning to increase the accuracy of the tool by developing a purging methodology to validate the data in DIST. At the end of January 1997, DIST officials told us that it would take 90 days to determine the methodology. DOD reported that the methodology was finally developed and implemented by the end of August 1997. DOD further reported that it is now checking DIST data on a system-by-system basis and is developing parametric and consistency checks for the data elements to ensure that the required data elements are fully and accurately populated by the users.

necessary to enable the CIO to achieve the Department's goals for systems interoperability, effectively implement an integrated technical architecture for the entire Department, and ensure the efficient exchange of standard data among systems.

Moreover, our review of the migration strategy suggests that a real threat to successful implementation of the Clinger-Cohen Act is the Department's consistent lack of adherence to sound decision-making and oversight processes. For example, at the oversight level, systems that clearly lacked key pieces of technical, programmatic, and economic justification were allowed to go forward. At the decision-making level, many functional areas did not even bother to submit their systems or analyses that supported their decisions to department-level oversight controls. If they were effectively followed, the life-cycle management controls would have helped ensure that sound business and development practices were followed for the migration systems.

Perhaps, the greatest challenge to successful operation, however, will be operating in an organizational environment that has resisted departmentwide oversight and visibility over information resources. For example, the Department's CIM effort largely failed in meeting its original goals of bringing widespread efficiencies to its business processes. The Department was unable to create meaningful change across organizational lines and management support was insufficient to overcome initial resistance to new ways of doing business. Efforts to implement the Clinger-Cohen Act will require unwavering top-level commitment to overcome both organizational resistance and to institute meaningful controls.

Recommendations

To ensure that DOD's continued investment in migration systems provides measurable improvements in mission-related and administrative processes, we recommend that the Secretary of Defense require the Defense components to rank development/modernization migration systems justifications and complete them on an expedited basis. Further, the Secretary should require the Chief Information Officer to review these justifications and certify that they include the following:

- A business case of operational alternatives for each functional area that clearly demonstrates that continued development and deployment of the migration system is the best solution for improving performance and reducing costs in the functional area it serves, when compared to other

available alternatives. The alternatives analyzed should include reengineering the functional area's processes before making investments in information systems and using, when appropriate, the private sector to perform major functions now performed by government personnel and information systems.

- An economic analysis showing a return on investment or other results-based benefits to the Department that justify further investment in the migration system.
- Current compliance with applicable Defense technical standards and uses standard data, or a schedule and plan for bringing the system into compliance with these standards.

Lastly, the Secretary of Defense should require the Chief Information Officer to establish routine procedures for reporting on the status of reviews of migration system justifications to the Deputy Secretary of Defense so the information can be used in the Department's planning, programming, and budgeting system. Any exception to the accomplishment of these reviews should be approved by the Deputy Secretary of Defense.

Further, we recommend that the Department's Chief Information Officer revise Defense's policies, practices, and procedures to institutionalize the management of information systems and technology expenditures as investments and ensure that these investments provide measurable improvements in mission performance. In the course of taking action on these matters, we recommend that the Secretary direct that the Chief Information Officer, in coordination with the Chief Financial Officer and other appropriate Defense officials take the following actions:

- Ensure that Defense's strategic information technology planning and investment control policies, practices, and procedures include requirements that Principal Staff Assistants document that they and the key stakeholders for their functional areas (including the services, agencies, and major commands) have (1) conducted thorough economic and risk analyses of alternative operational approaches (business case analyses) for accomplishing the mission of the functional area, (2) examined trade-offs among the competing proposals, and (3) prioritized the alternative proposals based on mission impact, risk, and return.
- Finalize and issue guidance for developing and using analyses of alternatives and economic analyses for information system decision-making. Once this guidance is issued, the CIO should require that

all Defense program managers and Defense managers, as appropriate, be trained in using the guidance. Also, the CIO should ensure that the guidance defines a standard return on investment definition for Defense information systems and require that this definition be used to calculate all returns on investment for information systems efforts. Additionally, the CIO should require that all major migration and other information systems under direct review by the Major Automated Information System Review Council (MAISRC), and those delegated by MAISRC to other oversight organizations for review, have their alternatives analyses and economic analyses independently verified by Defense's Program Analysis and Evaluation (PA&E) office, or another qualified independent review organization, in accordance with this guidance before major investments are authorized for system development/modernization.

- Require post-implementation reviews of migration and other information systems and ensure that these reviews are designed to compare actual systems' costs, benefits, risks, and returns against the original baseline estimates/projections and determine the causes of any differences between planned and actual results.
- Expedite the definition, coordination, testing, and implementation of information management performance measures in the Department and establish milestones for evaluating progress in implementing these performance measures.
- Modify the DIST system or acquire/develop a new Defense-wide management information system or systems for tracking and reporting key schedule, progress, and performance information on migration systems and other Defense information systems and ensure the system or systems contain complete, current, and accurate
 - schedule data necessary to track the progress of each migration system's development/deployment and each legacy system's termination;
 - budgeted and actual cost data on each system for which the Department maintains such data (an alternative to putting budget and cost data in DIST is to establish the capability to directly interface with other systems in the Under Secretary of Defense (Comptroller's) Office or other Defense organizations containing systems' budget and/or cost data);
 - data necessary to track the progress of each migration system in complying with applicable Defense technical and data standards, including whether each system has been independently certified to be in compliance with applicable technical and data standards;
 - data for tracking progress in accomplishing the mission-based performance goals and information management performance goals for

- the functional areas supported by each system once these data have been identified;
- information determined to be needed for oversight by the Defense Acquisition Board (DAB), MAISRC, and PA&E; and
 - other information determined to be needed for management and oversight by the Defense CIO, the CIO Council, other Defense senior managers, and the Congress.
 - Develop and implement management controls and a quality assurance program to ensure the DIST data's accuracy and completeness since these data are used to track and report to senior Defense managers and the Congress on the overall status of the migration initiative and on other Defense information management initiatives.

Agency Comments and Our Evaluation

The Department of Defense provided written comments on a draft of this report, which are reprinted in appendix I. The Acting Assistant Secretary of Defense for Command, Control, Communications and Intelligence concurred with five of our recommendations and partially concurred with two recommendations. Defense did not concur with the remaining five recommendations and expressed concerns about certain aspects of our report. Defense's concerns are highlighted and discussed below. Appendix I also provides detailed responses to DOD's views on our recommendations and to other specific comments on our findings.

Generally, the Department concurred with our recommendations that the Department revise or develop internal policies and procedures to conform to the Clinger-Cohen Act and to improve the performance of information systems management. Defense also noted that the issues we reported are in the process of being or will be addressed as it implements the Clinger-Cohen Act, the Federal Acquisition Streamlining Act, the Government Performance and Results Act, and the Paperwork Reduction Act.

However, it did not agree to a recommendation in our draft that it limit further investments to expenditures that meet mission critical needs until the investments are economically, functionally, and technically justified and such justifications are independently reviewed. In DOD's view, limiting migration system spending would adversely affect military readiness, system development, and government contract obligations and increase system obsolescence. We understand DOD's concerns regarding readiness and contract obligations. That is why our recommendation in the draft report recognized that critical needs still need to be met. Our point is that

greater management attention needs to be placed on the decision-making process for approving and funding the development and modernization of migration systems to achieve intended benefits and minimize unnecessary costs. In order to clarify this position, we modified our recommendation to focus on strengthening the controls for the migration system decision-making process so that these investments can be better considered in the Department's budget process.

In addition, Defense did not concur with a proposal in the draft report that it consider separating the CIO and the ASD C3I positions so that the CIO can devote full attention to departmentwide information resource management issues and provide independent oversight. It noted, however, that all ASD C3I functions are being reviewed by the Department's Task Force on Defense Reform as part of its review of the Office of the Secretary of Defense's organizational structure. We withdrew the proposal because DOD is now considering this matter. Nevertheless, our concern that the current structure of the CIO position does not allow the CIO to devote full attention to critical IRM issues—such as computer security, the Year 2000 problem, and the need to develop and implement an integrated information technology architecture—remains valid.

Defense also stated that our report overlooked one of the key cost reduction aspects of the migration effort—that is, modernizing multiple systems within each service and Defense agency is more expensive than simply modernizing one or a few departmentwide migration systems. While these cost reductions may be possible, Defense has not yet demonstrated that it has achieved such savings. Further, our review determined that Defense does not know, or track, cost reductions that result from its migration efforts. Finally, the achievements that Defense refers to in its comment letter are mostly the results of process reengineering, not the migration of automated systems.

Defense also stated that our report negatively portrays the role and benefits of acquisition streamlining within the Department. Defense reported that it uses a "best-value" approach to modernizing its systems that balances the functional and technical capabilities while still considering cost. We disagree with Defense's characterization of our report. We fully support acquisition streamlining efforts in DOD because they promote economy, efficiency, and effectiveness in the procurement of property and services. However, these three elements must be carefully balanced in order to achieve the results intended by the Division D of the Clinger-Cohen Act of 1996 which covers federal acquisition reform. Such a

balance is particularly important to achieve prudent decisions for an investment as substantial as the multibillion dollar migration initiative, and it is contemplated by the Clinger-Cohen Act of 1996 to properly control these investments.

In our view, for the migration effort, it appears that expediency was achieved at the expense of economy and effectiveness. In conducting our review, we sought to examine whether the Department of Defense was following its own policy for controlling migration investments. When we found that these policies were not executed as intended, we turned to the Department's acquisition review process, which should have supplemented oversight for the major migration systems. However, even here, we found that DOD for the most part, was not providing sufficient assurance that migration investments were worthwhile. Specifically, we found that controls that Defense built into this process would not ensure success.

In addition, the migration strategy is a high-risk endeavor because it requires Defense to carefully consider complex technical issues that are compounded by the sheer size of the Department, the number of disparate systems, and the prevailing culture, which promotes stovepiped systems solutions and hampers departmentwide oversight or visibility over information resources. As such, the success of the strategy hinges on whether practical and sound management practices—such as conducting economic, risk, and alternative analyses and providing rigorous oversight over the selection process—are followed. As we note in the report, these practices are required by executive branch policies; congressional reform initiatives, including the Clinger-Cohen Act, which took effect August 8, 1996; and/or Defense regulations. Under the Clinger-Cohen Act, for example, Defense is required to implement a process for selecting information technology investments using specific criteria for comparing and ranking alternative information system projects. The best practices on which the act is based have shown that to ensure the success of an investment process, top executives need to make funding decisions based on factors such as cost, risk, return on investment, and support of mission-related outcomes. Thus, unless Defense promptly embraces the need to develop and review economic, risk, and alternative analyses, it stands little chance of successfully implementing the Clinger-Cohen Act.

In its comments, Defense also expressed concern that the scope of our report was unnecessarily broader than it was when we began our review. We were originally asked for information on the status and cost of the

migration effort. However, when we found that Defense could not provide accurate and reliable information on migration or convincingly demonstrate whether the strategy has been successful, our congressional requester asked that we review whether Defense's management control and oversight processes for migration were ensuring that the investments are economically sound and complied with technical and data standards. We reviewed the reliability of the acquisition process controls over migration investments because they are the leading Defense-recognized controls over major investments. Our congressional requester also asked that we focus on DOD's implementation of the Clinger-Cohen Act because it offered a chance for DOD to bring meaningful reform to the management of migration and other information technology investments. Many information technology investments for systems in the Department are, in fact, migration systems.

Finally, Defense's comments on our report identify a number of other disagreements with our findings and conclusions. We reviewed these comments, incorporated them into our report where appropriate, and followed up with Defense on additional information it provided after submitting its response to us.

Comments From the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



COMMAND, CONTROL,
COMMUNICATIONS, AND
INTELLIGENCE

ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

September 12, 1997



Mr. Gene L. Dodaro
Director,
Accounting and Information
Management Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Dodaro:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) Draft Report, "DEFENSE IRM: Poor Implementation of Management Controls Has Put Migration Strategy at Risk," dated August 5, 1997, (GAO Code 511355; OSD Case 1427).

The Department has reviewed the draft report in detail and we are very concerned about its scope, inaccuracies and some of the conclusions and recommendations. Several of the recommendations which the GAO would like the DoD to initiate are already underway and are currently being addressed as part of the DoD implementation of the Clinger-Cohen Act of 1996. Specific responses to the GAO recommendations are provided in Enclosure 1.

Our review of the draft report reveals many conclusions unsupported by any continuous chain of logic and analysis and based on incorrect or out-of-date information. At the same time, the GAO appears to have ignored published DoD policy and the Department's documented results and accomplishments.

In our view, the draft report documents an excursion away from the task the Congress intended for the GAO to undertake as stated in the GAO memorandum of June 12, 1996, announcing the review. For example, in our review of the report, we fail to see how the review of migration systems strategies, specifically focusing on cost and schedule, translates to the very broad GAO recommendations that focus on how the Department should be organized and operated.

Our review of the draft report reveals questions about the accuracy of the data and the balanced portrayal of the facts. We have provided information and documentation that would make the report accurately portray the actual circumstances, however, this information has been ignored. For example, these inaccuracies



See comment 1.

See comment 2.

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Comments From the Department of Defense

include the changing of baselines on migration systems and the reporting of cost data and the review and oversight of Major Automated Information Systems Review Council (MAISRC) systems, especially as it relates to economic analysis. Specific comments are provided in enclosure 2.

See comment 3.

The description in the report of the relationship of the migration systems effort to the Corporate Information Management (CIM) initiative is inaccurate. The GAO indicates in the report that the migration effort is one of two approaches of the CIM effort, along with process reengineering. This grossly misrepresents the principles of the CIM initiative that involved several aspects: (1) corporate policy/planning, (2) process & data modeling, (3) process improvement, (4) performance measurement, (5) standard information systems and (6) computing and communications infrastructure. All these initiatives are extremely important to effectively fielding information systems to support the mission. To date we have over 160 major improvement projects documented. We have an additional 37 projects underway that increase readiness, reduce cycle time and cost, and respond to the needs of the warfighter in this technological age. These projects range across the whole Department as the following examples illustrate: US Atlantic Command's Information Intranet, Civilian Personnel Reengineering, Defense Investigative Service, Medical Logistics, Management of Consumables, Telemedicine, Strategic Warfare Planning, and DoD Travel Reengineering.

See comment 4.

Whether there was a CIM initiative or not, the migration effort should have been initiated to achieve its primary objective to eliminate duplication and reduce costs. The GAO cites a figure of \$18 billion for migration systems spending which is misleading and overly simplistic. Independent of the migration effort, information systems must be modernized, integrated with other systems and new capabilities added. The concentration of the GAO on purely cost issues is inappropriate. Each migration selection must be based upon a balanced assessment of functional and technical capabilities while still considering cost. This approach is preferred in order to ensure proper consideration of the criticality of the investment and to meet the primary objective of supporting the warfighter. Additionally, the GAO has ignored one of the key cost reduction aspects of the migration effort. The obvious benefit of reducing duplication is a reduction in the operational cost of replaced legacy systems, which the GAO recognizes and comments on. Another significant benefit is the cost avoidance of modernizing multiple systems within each Service and Defense Agency which is more expensive than simply modernizing one or a few DoD-wide migration system(s). This cost avoidance frees up funds to modernize other priority initiatives.

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See comment 5.

Acquisition streamlining is vilified in the draft report. The process-driven mentality of the report ignores the reality of acquisition streamlining initiatives. The report attempts to apply methodology in the DoD 5000 series regulations without an understanding of acquisition streamlining initiatives. The one size-fits-all approaches tried in the past, before the acquisition streamlining initiative, did not work as well. Furthermore, the GAO report faults the Department's acquisition oversight for many issues that are not acquisition related. The Department recognizes the need to expand its oversight to address the needs of the Chief Information Officer as well as the Defense Acquisition Executive, but it is naive for the GAO to assume that the CIO will rely solely on the current acquisition oversight process, developed prior to Clinger-Cohen, to oversee IT investments.


See comment 6.

The statements that MAISRC and Defense Acquisition Board (DAB) Programs have not been reviewed for compliance with applicable DoD technical and data standards are not accurate. All programs on the Major Automated Information Systems list are or will be Defense Information Infrastructure/Common Operating Environment compliant. The Defense Information Systems Agency supports the MAISRC as a member of Integrated Product Teams by validating all data elements and technical standards. These reviews are based on the standards and policies that exist at the time of the review.

The issues surfaced in this report have been or will be addressed with our implementation of the Clinger-Cohen Act, Federal Acquisition Streamlining Act, Government Performance and Results Act and Paperwork Reduction Act. The DoD is in the process of formally incorporating the requirements of these Acts into our regulatory guidance and oversight processes. Implementation of the requirements of these Acts will ensure improved fielding of information technology to support the warfighter.

We appreciate the opportunity to comment on the draft report.

Sincerely,



Anthony M. Valletta
(Acting)

Enclosures

DoD Response to
GAO DRAFT REPORT - DATED AUGUST 5, 1997
(GAO CODE 511355) OSD CASE 1427

"DEFENSE IRM: POOR IMPLEMENTATION OF MANAGEMENT CONTROLS HAS PUT
MIGRATION STRATEGY AT RISK "

RECOMMENDATIONS

- o **RECOMMENDATION 1:** The GAO recommended that the Secretary of Defense limit further expenditures in the development/modernization of migration systems to those expenditures that meet the critical needs of the Department. (p. 71/GAO Draft Report)

Now on p. 51.

See comment 7.

DOD RESPONSE TO THE DRAFT REPORT: Nonconcur. Neither the findings or conclusions presented in the GAO report warrant limiting capital investments. We intend to fully comply with the spirit and intent of the Clinger-Cohen Act regarding investment in information technology to include developing a capital planning and investment process revolving around the DoD Planning, Programming and Budgeting System (PPBS). That process will include the provisions of the Act regarding the criticality of information technology investments to the Department. As the GAO acknowledged in the report, the DoD has taken a positive step to turn around its information technology management process as part of its implementation of the Clinger-Cohen Act.

As previously indicated in response to other GAO Audit Reports, the DoD uses a best-value approach that balances functional and technical capabilities while still considering cost. This approach is preferred to ensure proper consideration of the criticality of the investment and to meet the primary objective of supporting the warfighter. Moreover, limiting expenditures will adversely impact force readiness, system development and government contract obligations. Finally, limiting expenditures in development and modernization is counter to improving the information technology support to the warfighter and will lead to increased obsolescence of our systems.

- o **RECOMMENDATION 2:** The GAO recommended that limitations on expenditures should continue until the Department's Chief Information Officer (CIO) certifies that the justifications -- (1) a business case of operational alternatives for each functional area, (2) an economic analysis showing a return on investment, and (3) current compliance with applicable Defense technical standards and uses standard data--were prepared, independently verified, and available for review for each migration system. (p. 72/GAO Draft Report)

Now on pp. 51-52.

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See comment 7.

DOD RESPONSE TO THE DRAFT REPORT: Nonconcur. See DoD response to RECOMMENDATION 1 on the implementation of the Clinger-Cohen Act, and RECOMMENDATIONS 5 and 7, below.

- o **RECOMMENDATION 3:** The GAO recommended that any exceptions to these justifications for migration system investments should be documented and only the Deputy Secretary or the Department's Chief Information Officer should be authorized to grant exceptions. (p. 72/GAO Draft Report)

Now on p. 52.

See comment 7.

DOD RESPONSE TO THE DRAFT REPORT: Nonconcur. See DoD response to RECOMMENDATION 1 on the implementation of the Clinger-Cohen Act.

- o **RECOMMENDATION 4:** The GAO recommended that the Chief Information Officer revise Defense's policies, practices, and procedures to institutionalize the management of information systems and technology expenditures as investments and ensure that these investments provide measurable improvements in mission performance. (p. 72/GAO Draft Report)

Now on p. 52.

DOD RESPONSE TO THE DRAFT REPORT: Concur. DoD policies, practices and procedures are being revised to satisfy the provisions of the Clinger-Cohen Act. The Secretary of Defense has published a policy memorandum on implementation of the Clinger-Cohen Act. The Department is reviewing, and will ultimately revise, a variety of DoD Directives and Instructions to reflect information technology investment policy. Once these policies are coordinated, they will be formally issued.

- o **RECOMMENDATION 5:** The GAO recommended that the Secretary direct that the Chief Information Officer, in coordination with the Chief Financial Officer (CFO) and other appropriate Defense officials ensure that Defense's strategic information technology planning and investment control policies, practices, and procedures include requirements that each Principal Staff Assistant document that they and the key stake holders for their functional area (including the Services, Agencies, and Major Commands) have conducted thorough economic and risk analyses of alternative operational approaches (business case analyses) for accomplishing the mission of the functional area, examined trade-offs among the competing proposals, and prioritized the alternative proposals based on mission impact, risk, and return. (p. 72-73/GAO Draft Report)

Now on p. 52.

See comment 8.

DOD RESPONSE TO THE DRAFT REPORT: Partially concur. Policies, practices and procedures relating to information technology planning and capital investment are being revised to satisfy the provisions of the Clinger-Cohen Act. The Secretary of Defense has published a policy memorandum on

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implementation of the Clinger-Cohen Act. The Department is reviewing, and will ultimately revise, a variety of DoD Directives and Instructions to reflect information technology investment policy. Once these policies are coordinated, they will be formally issued.

- o **RECOMMENDATION 6:** The GAO recommended that the Secretary direct that the Chief Information Officer, in coordination with the Chief Financial Officer and other appropriate Defense officials finalize and issue guidance for developing and using analyses of alternatives and economic analyses for information system decisionmaking. Once this guidance is issued, the CIO should require that all Defense program managers and Defense managers, as appropriate, be trained in using the guidance. Also, the CIO should ensure the guidance defines a standard return on investment definition for Defense information systems and require this definition be used to calculate all returns on investment for information systems efforts. (p. 73/GAO Draft Report)

Now on p. 52.

See comment 9.

DOD RESPONSE TO THE DRAFT REPORT: Partially concur. DoDI 7041.3, "Economic Analysis for Decisionmaking," dated November 7, 1995, indicates the minimum standards that an economic analysis must meet in order to be considered reasonably adequate. Within the analytic framework provided therein, Department analysts may apply those methods of analysis, including various tools, format displays, estimating relationships and models, that are most appropriate to the acquisition program under analysis. The depth and accuracy of each effort is determined by the size, impact and risk associated with the decision that the analysis is required to support. In addition to DoDI 7041.3, PA&E has developed and published an unofficial Automated Information System (AIS) Economic Analysis (EA) Guide that is designed to assist in the development of a standard approach to Information Technology (IT) EA. This Guide, however, recommends that the standard methods and formats provided be specifically tailored for each application, and is in keeping with acquisition streamlining. This approach has allowed flexibility and substantial economy in the IT EA process. It has been adequate to support the present Major Automated Information Systems Review Council (MAISRC) system wherein each Major AIS is reviewed individually.

We recognize that greater standardization may be required in the EA process in order to successfully implement a portfolio oversight process. A portfolio approach will require that different programs be evaluated against each other, hence, standard methods of measurement, analytic techniques, indicators and measure of merit will be required. In conjunction with the implementation of a portfolio approach, therefore, the Department will officially publish

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appropriate documents to provide minimum standards and guidance for the EA process, yet, hopefully, maintain a practicable level of flexibility required in order to address program differences and new analytic techniques.

- o **RECOMMENDATION 7:** The GAO recommended that the CIO should require that all major migration and other information systems under direct review by Major Automated Information System Review Council (MAISRC) and those delegated by MAISRC to other oversight organizations for review, have their alternatives analyses and economic analyses independently verified by Defense's Program Analysis and Evaluation (PA&E) office in accordance with this [analysis of alternatives and economic analysis] guidance before major investments are authorized for system development/modernization. (p. 73/GAO Draft Report)

DOD RESPONSE TO THE DRAFT REPORT: Nonconcur. The DoD 5000.2-R provides guidance in section 2.4. for the Analysis of Alternatives (AoAs) and in section 3.5 for Cost Analysis.

Nonconcur with recommendation that DoD Program Analysis and Evaluation Directorate (PA&E) perform an independent verification of analyses of alternatives. The Department requires that an AoA be prepared by the Principal Staff Assistant at Milestone 0. DoD policy also requires the Principal Staff Assistant to coordinate with PA&E and others early in the development of the AoAs. This approach is consistent with the Integrated Product Team (IPT) approach the Department has adopted for the conduct of acquisition and oversight. The DoD directive does not support the GAO recommendation that the PA&E perform an independent verification of the analysis. Department policy also requires acquisition program managers to prepare an Economic Analysis at program initiation. The policy requires the Principal Staff Assistant or Component to ensure that a Component cost analysis is conducted at program initiation. That analysis and PA&E's participation in all acquisition program Cost IPTs accomplish the independent review of economic analyses GAO proposes. PA&E also reviews and coordinates on all MAISRC Acquisition Decision Memoranda (ADM).

Further, only those systems reviewed directly by the OSD MAISRC require review by PA&E. The responsibility for ensuring that analysis of a delegated program has been completed and is valid is delegated to the Component. The DoD Component head, or delegated authority, has the responsibility for determining the independent activity responsible for preparing an analysis. To require otherwise would defeat the goal of delegation.

- o **RECOMMENDATION 8:** The GAO recommended that the Secretary direct that the Chief Information Officer, in coordination

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Now on p. 53.

See comment 10.

Now on p. 53.

with the Chief Financial Officer and other appropriate Defense officials require post-implementation reviews of migration and other information systems and ensure these reviews are designed to compare actual systems' costs, benefits, risks, and returns against the original baseline estimates/projections and determine the causes of any differences between planned and actual results. (p. 73/GAO Draft Report)

DOD RESPONSE TO THE DRAFT REPORT: Concur. The acquisition community is already taking steps to implement this recommendation for information systems. Recent MAISRC Milestone III ADMs have included the requirement for post-deployment performance evaluations and will continue to require these, as appropriate.

Now on p. 53.

- o **RECOMMENDATION 9:** The GAO recommended that the Secretary direct that the Chief Information Officer, in coordination with the Chief Financial Officer and other appropriate Defense officials expedite the definition, coordination, testing, and implementation of information management performance measures in the Department and establish milestones for evaluating the progress of implementing these performance measures. (p. 74/GAO Draft Report)

DOD RESPONSE TO THE DRAFT REPORT: Concur. The Department published an investment and measurement guide and revised internal regulations to incorporate GPRA and Clinger-Cohen performance measurement requirements. In March 1997, the DoD CIO approved the ITM Strategic Plan and directed Components to develop ITM Strategic Plans and investment criteria to be implemented during the next PPBS cycle starting in October 1997. Component ITM Strategic Plans have been received covering over 95% of the DoD Exhibit IT-43 resources. In compliance with the Clinger-Cohen Act and OMB guidance, the plans create specific strategic links to DoD missions and define performance indicators to measure progress. The DoD CIO has directed the development of specific performance indicators and a performance plan to focus CIO attention on achieving desired mission and IT support outcomes described in the DoD ITM Strategic Plan and influence future Department plans and programs at all levels.

Now on p. 53.

- o **RECOMMENDATION 10:** The GAO recommended that the Secretary direct that the Chief Information Officer, in coordination with the Chief Financial Officer and other appropriate Defense officials modify the Defense Integrated Support Tools (DIST) system or acquire/develop a new Defense-wide management information system or systems for tracking and reporting key schedule, progress, and performance information on migration systems and other Defense information systems. (p. 75/GAO Draft Report)

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DOD RESPONSE TO THE DRAFT REPORT: Concur. The DIST is the Department's official automated repository and backbone management tool for DoD's inventory of systems. It contains information on hardware platforms, operating systems, application languages, communications, and data interfaces. Since the fall of 1996, the Department has taken major actions to enhance the DIST with emphasis on three areas: ease of use, user access, and collection of information needed to address the Year 2000 problem. Actions are now underway to re-engineer the migration tracking tool and add additional fields to the database required to satisfy the needs of the DOD CIOs. The Defense Information Systems Agency (DISA) and ASD(C3I) are working closely with the CIO Council and DIST User's Group to ensure all requirements are documented and prioritized for implementation. An initial release of the new migration tracking tool is scheduled for delivery on October 30, 1997.

DISA and ASD(C3I) are working with the staff of the Under Secretary of Defense (Comptroller) to develop links between the planning and budgeting systems and the DIST. For the current Program Objective Memoranda (POM) Planning Cycle, the DOD Components are required to use the DIST Identification number when reporting system costs.

- o **RECOMMENDATION 11:** The GAO recommended that the Secretary of Defense direct the Chief Information Officer, in coordination with the Chief Financial Officer and other appropriate Defense officials to develop and implement management controls and a quality assurance program to ensure the DIST data's accuracy and completeness since these data are used to track and report to senior Defense managers and the Congress on the overall status of the migration initiative and on other Defense information management initiatives. (p. 75/GAO Draft Report)

DOD RESPONSE TO THE DRAFT REPORT: Concur. Beginning in June 1996, the Defense Information Systems Agency (DISA), the DoD organization that operates and maintains the DIST, has instituted a data base validation and data quality program to ensure that the DIST contains accurate and complete data. Data are being analyzed and suspect data (duplicative, inactive, and incomplete entries) are being reviewed with the Authorized Editors. The Department also plans to perform statistical sampling of DIST data to validate accuracy, and will rely on the DODIG, during its Year 2000 audits, to validate DIST data. The Department will closely monitor this program to ensure that the data quality of the DIST is at the highest level as required for reports to senior Defense managers and the Congress.

- o **RECOMMENDATION 12:** The GAO recommended that the Secretary consider separating the CIO and Assistant Secretary of Defense

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for Command, Control, Communications and Intelligence (ASD C3I) positions so that the CIO can devote full attention to department-wide information resource management (IRM) issues and provide independent oversight. (p. 75/GAO Draft Report)

DOD RESPONSE TO THE DRAFT REPORT: Nonconcur. However, all ASD(C3I) functions are being reviewed by the Secretary of Defense in his study of OSD and the Defense Agencies.

See comment 11.

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PROGRAM ANALYSIS
AND EVALUATION

OFFICE OF THE SECRETARY OF DEFENSE
1800 DEFENSE PENTAGON
WASHINGTON, DC 20301-1800



August 28, 1997

MEMORANDUM FOR OASD(C3I) ATTN. MR. KENNETH GLASSER

SUBJECT: Comments on GAO Report "Defense IRM" GAO/AIMD-97-105, Aug. 1997

In general, we concur with the comments and recommendations of the subject report. We support, fully, the recommendation to implement a portfolio IT oversight process. Three issues, however, merit further comment.

The first concerns the report's list of fourteen Major AIS systems for which PA&E analysts had indicated no knowledge of an Economic Analysis (p.41). Seven of these systems were delegated to DoD Component oversight, hence, PA&E analysts would not normally review their supporting EAs. Five of the systems were characterized as at or still prior to Milestone 0 review, hence, detailed EA would not be available for these programs. Respectively, the lack of PA&E review of the EAs for these programs despite substantial investment, appear to indicate that the MAISRC may prematurely delegate Major AIS programs and that it does not continue to police them subsequent to delegation. Further, the lack of EAs for programs that have expended substantial resources and still have not had Milestone 0 approval, may indicate that the MAISRC does not have adequate means to determine that programs meet MAISRC thresholds until after substantial investment has occurred. Both of these problems stem from MAISRC cognizance and scheduling rather than from EA problems.

The second issue regards that statement (p. 40) that the Department has not yet established a set of minimum standards that an EA must meet to be considered valid. Department of Defense Instruction 7041.3, "Economic Analysis For Decisionmaking", (November 7, 1995), indicates the minimum standards that an Economic Analysis must meet in order to be considered reasonably adequate. Within the analytic framework provided therein, Department analysts may apply those methods of analysis, including various tools, format displays, estimating relationships and models, that are most appropriate to the acquisition program under analysis. The depth and accuracy of each effort is determined by the size, impact and risk associated with the decision that the analysis is required to support. In addition to DoDI 7041.3, PA&E has developed and published an unofficial AIS EA Guide that is designed to assist in the development of a standard approach to IT EA. This Guide, however, recommends that the standard methods and formats provided be specifically tailored for each application, and is in keeping with acquisition streamlining. This approach has allowed flexibility and substantial economy in the IT EA process. It has been adequate to support the present



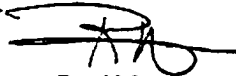
Now on p. 33.

Now on p. 32.

MAISRC system wherein each Major AIS is reviewed individually. We recognize, however, that greater standardization may be required in the EA process in order to successfully implement a portfolio oversight process. A portfolio approach will require that different programs be evaluated against each other, hence, standard methods of measurement, analytic techniques, indicators, and measures of merit will be required. In conjunction with the implementation of a portfolio approach, therefore, the Department will officially publish appropriate documents to provide minimum standards and guidance for the EA process, yet, hopefully, maintain the highest practicable level of flexibility required in order to address program differences and new analytic techniques.

Now on p. 33.

The third issue concerns the disposition of the fourteen Major AIS programs indicated (p. 41) as not having submitted EA's for independent review by the MAISRC. Acquisition oversight and corresponding independent EA reviews for seven of these systems (AFMSS, Army GCCS, CCIPS, NTCS-Afloat, OSS, TSC and TOPS) were delegated to the DoD Components. The MAISRC and PA&E will review these programs only if special conditions such as a baseline breach occur. Three of the programs (ADS as part of CHCS II, DPS and TCAIMS II) were at the pre-Milestone I level whereat comprehensive EA's are still being developed. PA&E will review these programs prior to their next milestone reviews. Two of the programs (GCCS and DJMPS) became MAISRC programs late in their development cycles. Partial independent EA's for these programs have been conducted and future investments will be independently reviewed based on the level of risk they represent. Finally, two of the programs (DM and MM) experienced a high level of baseline flux due to program funding reductions recommended by PA&E based on independent EA assessments. Both of these programs have subsequently been terminated.



Ronald C. Wilson
OD(PA&E) Analyst

The following are GAO's comments on the Department of Defense's letter dated September 12, 1997.

GAO Comments

1. The scope of our work was directed by the Congress. Defense is correct that the initial scope was expanded, at the direction of our congressional requester because Defense was unable to provide complete and accurate information to answer the initial questions. These questions were (1) What are the reported costs for migration systems and the legacy systems Defense expects to terminate for fiscal years 1995, 1996, and 1997? (2) How many and what type of migration systems did Defense designate, how many legacy systems did Defense terminate, and how many are scheduled for future termination? and (3) What economic studies did Defense prepare and use to justify its migration actions? Because Defense was unable to provide satisfactory answers to these initial questions, our congressional requester directed us to expand our work to evaluate Defense's management controls over decision-making for selecting and implementing migration systems. When we found that Defense was not following the Department-level management controls that had been established for overseeing the selection and implementation of migration systems, we looked for other Department-level management controls over migration systems. We found that Defense's oversight of major systems acquisitions by MAISRC and DAB was one of the few Department-level management controls over migration systems. However, because these management controls were limited to the major migration systems, we looked for Defense actions that would increase Department-level management control over all migration systems. This led us to examine Defense's actions to implement the Clinger-Cohen Act of 1996. Throughout our review, we kept our congressional requester and our Defense point of contact informed about changes in the scope of our work.

2. We reviewed the accuracy of all data in the report, especially data that Defense questioned in tables, figures, and the text regarding (1) the number of migration systems selected by the functional managers and approved at the Department level, (2) the costs Defense reported to us for migration systems, and (3) our findings related to the preparation and independent review of economic analyses for major systems under review by MAISRC. We contacted the appropriate Defense officials and discussed each instance in which Defense questioned the accuracy of data. We also requested that these officials provide us additional documentation pertaining to the data in question. Based on these discussions and our review of the additional documentation, we made changes where

appropriate. In the few cases in which changes were warranted, we changed the table, figure, or text.

3. We agree that CIM consists of several aspects, and we stated this in a footnote in the report. However, our work showed that as CIM was implemented, Defense emphasized two ways of achieving process improvements and addressing problems associated with its disparate and stovepiped information technology environment: (1) business process reengineering and (2) migration.

4. As we state in our report, the \$18 billion dollar estimate for developing, maintaining, and deploying migration systems for fiscal years 1995 through 2000 is based on cost information provided to us by Defense. Defense provided essentially the same information to the Congress in April 1996. We agree it is incomplete and inaccurate, and we stated so in our report.

In addition, we agree that migration selections should be based on a balanced assessment of functional, technical, and cost factors. However, we found that Defense's selections placed very little emphasis on costs and related economic factors. Our work showed that in Defense, the preparation of an economic analysis is often a paper exercise to produce a document that decisionmakers do not use when deciding whether to invest in an information system development or modernization project. Additionally, we found that in many cases, Defense placed little importance on having complete and accurate information on system development/modernization projects' estimated costs and benefits at the time decisions were made to invest in the projects.

Further, we agree with Defense's contention that modernizing multiple systems would normally be expected to be more expensive than modernizing a smaller number of migration systems. In fact, our report does not take issue with the migration strategy's potential to reduce costs. Rather, it shows that Defense's poor management controls over migration systems may have kept Defense from achieving expected cost reductions or, worse yet, resulted in wasting hundreds of millions of dollars on failed efforts such as the materiel management migration initiative. Also, because Defense has not tracked the cost reductions and other measurable improvements that may have been achieved through migration, Defense cannot demonstrate the extent that savings are actually occurring.

5. We fully support acquisition streamlining initiatives and encourage improvements. However, a balance between function, technology, and cost is as necessary as a balance between acquisition streamlining and effective management controls to reduce risk. We found that Defense's streamlined approach to acquisition oversight and its revisions of its acquisition policy in March 1996 resulted in inadequate management control over major systems acquisition projects. Specifically, acquisition processes did not fully ensure that economic analyses for migration projects were prepared and reviewed and that systems complied with technical and data standards. This increased the risk that functional areas would develop faulty cost estimates and risk assessments and pursue flawed efforts without rigorous department-level oversight.

While we do not support a one-size-fits-all approach to acquisition oversight, we believe that Defense's existing acquisition oversight processes do not require the degree of standardization in methodology and analytic techniques to ensure the preparation of the economic analyses necessary to support a portfolio management approach for information technology investments, as required by the Clinger-Cohen Act of 1996. Further, under OMB's Capital Programming Guide, which was issued in July 1997, Defense will be required to perform an economic analysis, along with other extensive planning steps, before submitting a budget proposal for major information technology projects.

If Defense is to effectively implement the Clinger-Cohen Act of 1996 and integrate its requirements with those of the Government Performance and Results Act, the Paperwork Reduction Act, and the Chief Financial Officers Act, changes will be necessary not only in Defense's acquisition oversight processes but also in its other information technology investment and management control processes. Further, to effectively implement the requirements specified in these laws, the Chief Financial Officer, Defense Acquisition Executive, and leaders of the services, agencies, and major commands must work cooperatively with the CIO.

6. We recognize that DISA reviewed system documentation for many of the major migration systems to determine if it indicated that interoperability issues were being addressed or were intended to be addressed as the system was developed. However, our work showed that DISA does not regularly report detailed information to MAISRC and DAB that would enable these oversight organizations to ensure that each major system is adequately complying with applicable technical and data standards. For

example, DISA does not regularly report to MAISRC and DAB such detailed information as

- each system's current compliance with applicable standards—that is, each system's current status relative to the eight levels that Defense has defined for the Defense Information Infrastructure Common Operating Environment and each system's number and percentage of data elements that have been approved as Defense data standards in the Defense Data Dictionary System;
- whether each program office prepared sound strategies, schedules, and cost estimates for achieving compliance with applicable standards;
- whether each system's compliance strategy and cost estimate were approved by DISA;
- each system's current schedule and cost status for achieving compliance compared against its baseline schedule and cost estimate; and
- whether each system has been independently certified by DISA's Joint Interoperability Testing Command to be in compliance with the technical and data standards.

MAISRC analysts responsible for overseeing the major migration systems confirmed that they did not know (1) many of the systems' current status regarding compliance with applicable technical standards and use of Defense standard data, or (2) whether the program managers had developed and were following sound strategies for bringing the systems into compliance.

As noted in our report, Defense's technical and data standards are supposed to help pave the way to an interoperable systems environment. However, without complete and accurate data on individual systems' compliance with standards, MAISRC and DAB or any other DOD manager cannot assure the CIO that Defense's major information systems are complying with the standards. Without this information, as well as standards compliance information from the managers of Defense's nonmajor systems, Defense's CIO cannot gauge the Department's progress toward achieving its goal of an interoperable systems environment.

7. As noted in the "Agency Comments and Our Evaluation" section of our report, we modified our recommendation to focus on strengthening the controls for the migration system decision-making process so that these investments can be better considered in the Department's budget process. Nevertheless, we remain concerned that if Defense proceeds with its decisions to develop/modernize major migration systems without ensuring

that they are based on sound investment decision-making practices, it will risk some portion of these investments not providing measurable improvements in mission performance for the warfighter. Defense will also risk the systems' not operating as intended and not being interoperable with other systems.

We have reported on numerous occasions that poorly planned and managed systems development/modernization efforts often fail and must be restarted, delaying the delivery of systems that can effectively meet the warfighter's needs. This wastes the limited funds Defense has available for providing information technology support to the warfighter and unnecessarily diverts funds from other needed investments. For example, our review of Defense's materiel management migration strategy showed that Defense spent over \$700 million pursuing a substantially flawed effort that was later abandoned. We found that Defense's planning and decision-making for this strategy were not sound: Defense did not complete an economic analysis until nearly 3 years after the effort began, and the analysis was not updated even though Defense dramatically changed the course of the systems development. We are concerned that Defense may repeat this experience unless it ensures that the remaining migration system investment decisions are based on sound planning.

8. Defense's response does not clearly specify why it partially concurred rather than fully concurred. Nevertheless, it is critical that in revising its directives and instructions, DOD require that the PSAS document that they and the key stakeholders for their functional areas (including the services, agencies, and major commands)

- have conducted thorough economic and risk analyses of alternative operational approaches (business case analyses) for accomplishing the mission of the functional area and
- have examined trade-offs among the completing proposals and ranked the alternative proposals based on mission impact, risk, and return.

Undertaking such reviews is a sound business practice that is consistent with the planning and management practices called for in the Clinger-Cohen Act of 1996.

9. We disagree with DOD's position that DODI 7041.3 provides adequate guidance for preparing of an economic analysis for an information system development/modernization effort. The existing DODI 7041.3 regulation, dated November 7, 1995, is very general. Defense itself recognized that the

regulation was insufficient guidance for preparing an economic analysis because it developed and published an unofficial economic analysis guide to supplement the regulation. That unofficial guide recommended, but did not require, standard methods and formats for preparing an economic analysis for an information system development/modernization project. According to a PA&E representative, this unofficial guide is no longer adequate because it does not require the degree of standardization in methodology and analytic techniques needed to support a portfolio management approach for information technology investments, as required by the Clinger-Cohen Act of 1996. For example, the guide does not require that returns on investment for systems development/modernization projects be calculated in a standard manner using a standard definition. This lack of standardization results in economic analyses for different systems that are not comparable enough for DOD managers to have a good basis for deciding which systems offer the highest payoffs. Defense stated that in conjunction with its implementation of a portfolio management approach, it plans to officially publish appropriate documents and provide minimum standards and guidance for the economic analysis process. However, Defense has not established a time frame for completing and publishing the guidance. An expedited time frame is needed so that this effort can be given adequate priority for resources.

10. Although DOD's existing acquisition regulations do not require independent review and verification of *alternatives analyses* for major information technology investments, conducting independent reviews of key decision-making documents is a good business practice consistent with the type of sound information technology investment planning promoted by the Clinger-Cohen Act of 1996. An independent review of an alternatives analysis helps ensure that the methodology used to conduct the analysis is sound and that the information is accurate and complete and can be relied on for choosing among competing investment options. This helps to ensure that the alternative analysis will serve its purpose: to provide a reliable, detailed, systematic evaluation of alternative solutions in terms of costs and accompanying benefits so that decisionmakers can judge whether the proposed alternatives offer sufficient military or economic benefits to be worth their cost, and to determine which alternative is the best approach. By not requiring independent review of alternatives analyses, Defense increases the risk of making poor decisions to pursue particular options for developing or acquiring migration systems. It also risks sending a message throughout the Department that it is acceptable to decide to invest in major information technology

projects without the benefit of complete and accurate information on the estimated costs and benefits of alternative investments.

Where *economic analyses* are concerned, Defense is correct in stating that its existing acquisition regulations do not require that economic analyses for delegated systems be independently reviewed by PA&E. Our recommendation has been revised to enable verification by other qualified reviewers. However, our recommendation is still valid since our review revealed that Defense does not ensure that economic analyses for delegated systems are independently reviewed by any qualified reviewer.

We identified seven major delegated migration systems for which economic analyses had not been prepared or updated and independently reviewed even though substantial investments had already been made in them. The failure to obtain independent review for these systems and to fully address concerns raised by the reviewer is unacceptable since it increases the chances that inaccurate, incomplete, and unreliable cost and benefit information will be used to justify a costly system project. Assuming this risk is hardly a wise choice given that as a result, Defense may end up using scarce resources to build information systems that offer less payback than available alternatives. In addition, we believe that the failure to obtain an independent review of an economic analysis is certain to decrease the value of the analysis as a management tool for such activities as Defense's formulation of the Program Objective Memorandum, budget justifications, ranking of investment alternatives, laying a baseline for tracking performance improvements, coordination of project development schedules and costs, sensitivity ("what if") analyses, and identification of project components that are unfunded.

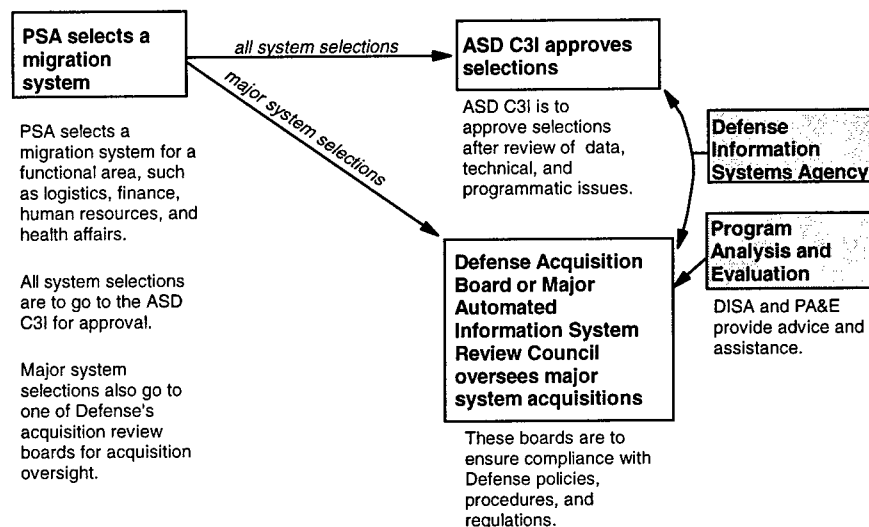
Furthermore, even though DOD's acquisition regulations do not require that PA&E be the economic analysis reviewer for delegated systems, because PA&E has the necessary expertise, it makes sense that DOD use PA&E to conduct these reviews. Also, the reviews should be more consistent if PA&E performs all the economic analysis reviews for major systems. Regardless of whether PA&E or another qualified independent organization performs the independent reviews, it is critical that an independent review be made of the economic analyses for major information technology investments and that problems identified in the analyses are addressed before investment decisions are made.

11. See "Agency Comments and Our Evaluation" section in chapter 4.

Description of the Migration System Decision Process

As shown in figure II.1, Defense's migration system selection process is principally the responsibility of the managers of Defense functional areas (such as logistics, finance, human resources, and health affairs) with assistance by the technical staff who report to and advise the ASD C3I.

Figure II.1: Migration Selection and Oversight Processes



Source: GAO review of Defense regulations, memorandums, related documents, and interviews with Defense officials.

The specific steps involved with the process illustrated above are explained in more detail in the following sections.

Principal Staff Assistant (PSA) Selects the Migration System

PSAs are the senior Defense managers for the functional areas. They include Under Secretaries, Assistant Secretaries, the Inspector General, the Director of Operational Test and Evaluation, the General Counsel, and a number of other top DOD officials. PSAs are responsible for choosing migration systems from their respective functional area legacy systems or for developing new systems.

An important first step involved with deciding whether to migrate and determining the migration system(s) that will best support the functional

area is assessing the functional area's business processes and deciding if changes are needed. For example, a functional area may be better off outsourcing a process rather than attempting to bring improvements through internal information system modifications. Or, it could decide that it should fundamentally change its business processes and acquire different information systems or significantly modify existing systems to better support the new processes. In DOD, the functional area goes about making this broad evaluation of paths toward improvement and making a "business case" for the selected path through the preparation of a *functional economic analysis*. In most cases, functional areas have concluded that migration is a viable strategy for improvement.

When it embarked on its accelerated migration strategy in 1993, Defense allowed PSAS to tailor the functional economic analysis, as appropriate, to expedite the migration system selections. At the same time, however, PSAS and program managers who manage the individual acquisition projects were told that they should still follow requirements already established for developing and maintaining automated systems (life-cycle management processes). For example, managers would still need to perform an *economic analysis* for migration systems to establish a baseline life-cycle cost and benefit estimate for the projects.¹ This analysis follows the decision to migrate has been made and should be based on an analysis of alternative life-cycle costs, benefits, and risks involved in feasible approaches for the project.

¹Defense regulations require that an economic analysis and an alternatives analysis be prepared to support all major information systems investments that meet the MAISRC review criteria. However, for those major systems that meet criteria for oversight by the DAB, Defense regulations require an independent cost estimate, rather than an economic analysis. For nonmajor information system investments that do not meet either MAISRC or DAB review criteria, OMB and Defense guidance, as well as best industry and government practices, recommend that an economic analysis and an evaluation of alternatives be prepared to help decisionmakers estimate the costs and benefits for the project and choose the most cost-effective approach among competing information technology investments.

The ASD C3I Approves the Systems Selected for Migration²

After the PSAS select the migration systems for their functional activities, the selections are to be sent to the ASD C3I for approval. In deciding whether to approve the selections, the ASD C3I reviews data, technical, and programmatic factors. These include:

- Whether the migration systems will lend themselves to data-sharing within their design. A key step in the process of ensuring this ability to share data is known as *data standardization*. This involves reaching agreement on standard definitions that are to be used for the data elements' names, meanings, and other characteristics so that all users of the data have a common, shared understanding of it.
- Whether the migration systems currently conform to or can evolve to conform with Defense's *technical standards*. These technical standards are a set of "building codes" for constructing systems to ensure that they will be compatible with Defense's communications and computing infrastructure and technically interoperable with each other.³
- Whether the system selections are supported by a full or abbreviated functional economic analysis or other similar justification.

The Defense Information Systems Agency (DISA) assists in the review of these factors and passes on any concerns it has to the ASD C3I.

Major Migration Systems Also Undergo DOD's Major Systems Acquisition Review Process

In addition to the management and oversight processes established specifically for the accelerated migration strategy, the major migration systems are also subject to Defense's traditional major information systems acquisition oversight processes by either the Defense Acquisition Board (DAB) or the Major Automated Information System Review Council (MAISRC). DAB generally provides oversight for weapon systems while MAISRC provides oversight for management information systems.

²To foster an Enterprise Integration approach and augment the approval process for initial migration selections, Defense established a top management oversight structure to help resolve issues affecting multiple functional areas and to promote cross-functional planning and information-sharing. This structure consisted of two committees: (1) the Enterprise Integration Executive Board, which was chaired by the Deputy Secretary of Defense and included the most senior executive members in the Department, and (2) the Enterprise Integration Corporate Management Council, which served as a supporting committee and was co-chaired by the Principal Deputy Under Secretary of Defense for Acquisition and Technology and the ASD C3I. However, these committees were deactivated in the summer of 1995—about 1 year after they were established—after the Deputy Secretary decided they were not working as intended.

³Defense's technical standards for constructing information systems include, among others, the Technical Architecture Framework for Information Management (TAFIM) and the Defense Information Infrastructure Common Operating Environment (DII COE).

Specifically, DAB reviews those systems that (1) are estimated to eventually cost over \$355 million to research, develop, test, and evaluate, (2) have estimated procurement costs of over \$2.135 billion, or (3) are designated for DAB review by the Under Secretary of Defense for Acquisition and Technology, who also chairs DAB. MAISRC reviews those systems that (1) are anticipated to cost \$30 million or more a year, (2) have estimated program costs in excess of \$120 million, (3) have estimated life-cycle cost of more than \$360 million, or (4) are designated for MAISRC review by the ASD C3I, who also chairs the MAISRC.⁴

DAB and MAISRC reviews involve assessing such matters as whether the proposed system is being developed in accordance with Defense policies, procedures, and regulations; the systems' program managers took steps to minimize the cost of a new system by ensuring full and open competition; and the program managers will effectively use advanced system design and software engineering technology to minimize software development and maintenance costs.

When the DAB or MAISRC staffs review a migration system, they obtain assistance from the Program Analysis and Evaluation (PA&E) staff to review the system's economic analysis or cost estimate. This staff is responsible for reviewing economic analyses for major information systems and determining whether cost and benefit estimates are accurate and complete. PA&E analysts are recognized as DOD's experts on economic and cost analyses. Organizationally, PA&E reports to the Under Secretary of Defense (Comptroller). MAISRC requests that DISA provide technical reviews of the plans and other key documents prepared to support the system's development. MAISRC also obtains assistance from other Defense organizations in reviewing the systems.

Program managers for the systems reviewed by MAISRC provide periodic progress information to MAISRC regarding such issues as cost, schedule, return on investment, and compliance with technical and data standards. Generally, this information is provided in written quarterly reports, which may be tailored to meet the needs of both the program manager and MAISRC. In addition, MAISRC conducts in-process reviews of the systems by establishing "integrated product teams" that provide advice and assistance to the systems' program managers on various subjects as needed to progress through the acquisition process.

⁴These dollar amounts are in fiscal year 1996 constant dollars (dollar amounts after they have been adjusted for the effect of inflation).

Detailed Analysis of Migration Cost Information

Having accurate and reliable cost and inventory information is critical for decision-making purposes. It helps Defense managers to determine whether migration system investments will be cost-effective and whether enough funds will be available for developing and deploying the system. However, Defense's migration cost information is incomplete and may be significantly understated.

Collecting cost information for migration systems in itself is a challenging task because Defense does not maintain complete cost information on all of the migration systems in the Defense Integration Support Tools (DIST) database—its primary information system tracking tool. Thus, to report to the Congress and others on migration costs, Defense must turn to numerous sources. For example, in providing information on costs to the Congress in April 1996, Defense asked individual functional area managers to provide total estimated cost data for each of their migration systems for fiscal years 1995 through 2000.

Defense officials stated that cost data are not maintained in DIST because functional area managers expressed concern that controls were not adequate to ensure that only authorized personnel were allowed access to the data. They also noted that Defense does not have budget information for all the migration systems because it does not separately budget or collect information for systems with annual cost of less than \$2 million. In fiscal year 1996, DOD's Office of the Under Secretary of Defense (Comptroller) maintained budget information on the systems that cost \$2 million or more and is currently working on including all migration systems and other information system costs (for systems with annual costs of more than \$2 million) within one database.

Cost Information Is Incomplete

In December 1996, Defense provided us with cost information on the migration effort, but these data provided costs for only 242 of the 363 migration systems. We did not include costs in this report for 27 of 242 systems for which DOD collected costs because the systems were classified. Defense did not provide us costs for the remaining 121 systems because the Office of the ASD CSI had not collected costs for these systems.

When we reviewed the cost data reported for the clinical health, civilian personnel, and transportation areas, as part of our review of migration

systems' cost reported to the Congress in April 1996,¹ we identified three reasons why the functional areas did not report costs for some systems. First, for some of the systems, these costs were not available at the time the report was made to the Congress. Second, for other systems, the functional area managers were not aware that the report was to include interim migration systems. Third, for some systems, functional area approval as a migration system may not have been completed at the time cost data were gathered for the report to Congress. As table III.1 illustrates, the costs not reported represented a substantial portion of the total being spent on migration for the three functional areas.

Table III.1: Costs Reported to the Congress Compared to Costs Reported to GAO for Clinical Health, Civilian Personnel, and Transportation

Dollars in millions			
Functional area	Total costs reported to the Congress	Total costs reported to GAO	Difference (amount not reported to the Congress)
Clinical Health	\$1,014.0	\$2,451.3	\$1,437.3
Civilian Personnel	67.4	123.9	56.5
Transportation	1,005.2	1,116.6	111.4
Total	\$2,086.6	\$3,691.8	\$1,605.2

Source: GAO's analysis of information obtained from the April 1996 Report to the Congress, Defense functional area managers, and the ASD C3I.

Significant Costs Not Tracked

We also found that Defense does not account for some very important costs related to developing, deploying, and maintaining migration systems both before and after a project has been initiated. It is extremely important to have accurate estimates up front on direct, indirect, and support costs associated with a system development or acquisition project and to be able to track these costs throughout the life-cycle. At the beginning of a system development project, a complete cost picture provides an organization with a realistic picture of what it will take to develop, deploy, and maintain a system over its life-cycle. It also enables an organization to make sound trade-off decisions among competing investments. Continually tracking direct, indirect, and support costs helps managers account for their past activities, manage current operations, and assess progress toward planned objectives.

¹As stated in chapter 1, this report was made pursuant to a requirement in Section 366 of the National Defense Authorization Act for Fiscal Year 1996.

As noted in this report, when we conducted detailed reviews of selected finance and logistics migration efforts, we found that DOD excluded significant categories of costs from its initial life-cycle cost estimates. Furthermore, our work in the clinical health, civilian personnel, and transportation functional areas showed that DOD also does not capture and report the total actual costs for its systems as they are developed, deployed, and maintained. Instead, DOD decisionmakers employ cost accounting systems that omit relevant project costs, such as those associated with project management and oversight. The transportation functional area, for example, has an office designated to oversee the development and deployment of its migration systems. But, when accounting for costs for the systems, DOD does not factor in the cost to maintain this oversight responsibility. As a result, DOD cannot reliably report migration system projects' actual costs and compare them against established baselines, and it cannot reliably use information relating to projects' actual costs to improve future cost estimating efforts.

Beginning October 1, 1996, a new federal accounting standard requires the Department of Defense and other federal agencies to begin accounting for all identifiable direct, indirect, and support costs of its outputs. This would provide a mechanism for developing total costs of capital items, such as information systems. This requirement is defined in the Statement of Federal Financial Accounting Standards, (SFFAS) No. 4, Managerial Cost Accounting Concepts and Standards for the Federal Government.

Detailed Analysis of Database Used to Collect Migration Information

There are a number of data integrity problems associated with the DIST database, which is used to keep information on Defense’s migration systems. These problems directly affect Defense’s ability to accurately determine how many legacy systems were terminated and how many are scheduled for termination. Defense officials acknowledge that the DIST database is incomplete and inaccurate, but stated they used it to generate reports to the Congress because it was the only departmentwide database containing schedule and other descriptive data on all of Defense’s migration and legacy systems.

When we obtained a copy of the DIST database for analysis in April 1996, Defense’s own analysis of the DIST database confirmed that it had incomplete data in several categories of key information. A more recent Defense analysis of migration systems showed that DIST continues to have high levels of incomplete data. Table IV.1 illustrates how information was incomplete in several categories of information.

Table IV.1: Levels of Incompleteness in DIST in April 1996 and February 1997

Data category	Percent of systems with incomplete data	
	April 1996	February 1997
Interfaces with other systems	88	55
Computer installations where the system operated	79	77
Computer hardware on which the system operated	75	68
System software	66	61
Organization responsible for the system	32	26

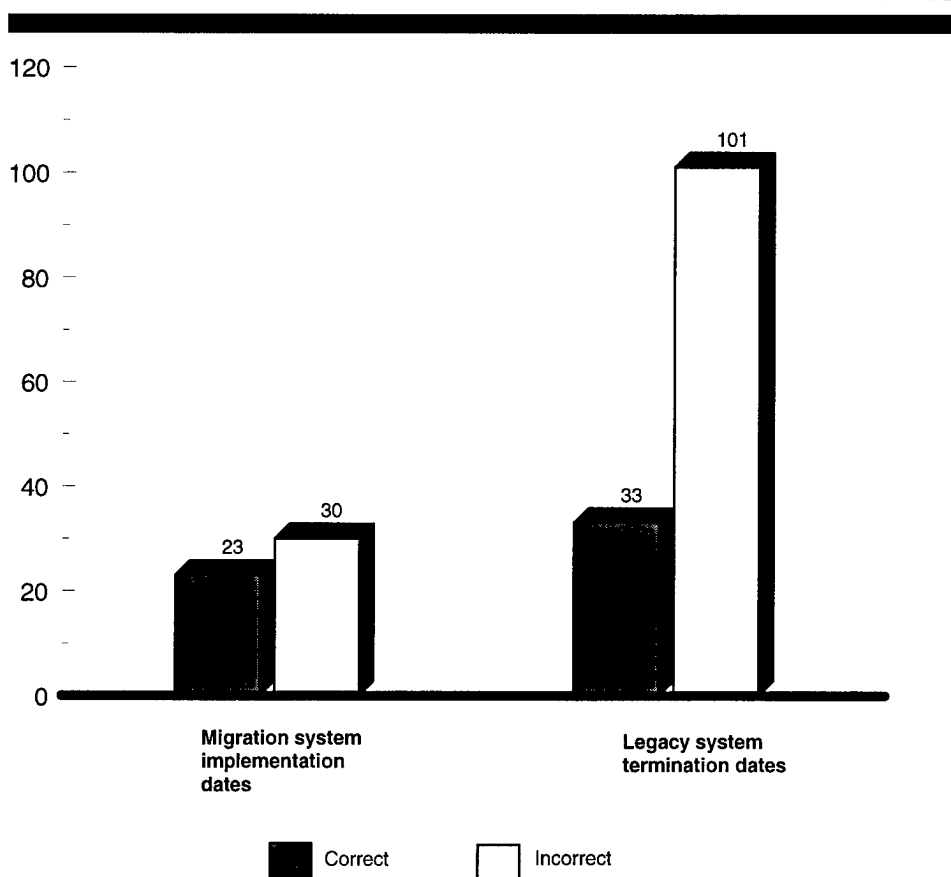
Source: GAO analysis of DIST Data Status Working Papers.

Our analysis supports Defense’s concerns as still relevant and identified the following additional data integrity problems.

- Large numbers of migration system implementation dates (220, or 61 percent) of the migration systems’ implementation dates and legacy system termination dates (629, or 32 percent) shown in DIST were in the year 2010. According to system documentation and our discussions with officials responsible to operate DIST, the presence of the year 2010 for these dates indicates the system owners responsible for the migration systems did not provide a date, resulting in the DIST system automatically inserting the default date of 2010.

- As figure IV.1 illustrates, when we compared the DIST schedule data for clinical health, civilian personnel, and transportation to the actual schedule maintained for these areas, we found that incorrect data for migration implementation and legacy system termination outweighed correct data.

Figure IV.1: Number of Incorrect and Correct Migration and Legacy System Dates for Clinical Health, Civilian Personnel, and Transportation



Sources: GAO's analysis of information obtained from the DIST, April 1996 Report to the Congress, Defense functional area managers, and ASD C3I.

Functional area managers in these three areas identified additional inaccuracies. For example, managers in the transportation area stated that

the area had implemented six migration systems rather than none as indicated in DIST. For the three functional areas, DIST showed that 92 legacy systems were terminated by April 1996, while functional managers told us that only 43 had actually been terminated. Also, for the three functional areas, DIST showed that 53 legacy systems were scheduled for future termination, but functional managers told us that 91 were slated for future termination.

We also learned that DIST has other problems that hamper its use. One problem is that Defense has not ensured that the data definitions and formats used in DIST are fully compatible with data maintained in other Defense information systems that track and report on systems. While DOD is attempting to address this issue, DISA provided us information showing that only 66 of the 218 data elements contained in the DIST have been approved as standard data elements in the Defense Data Dictionary System. Without standard definitions and data formats, data cannot be easily transferred to DIST from other systems that may be used by PSAs, program managers, and other decisionmakers.

In addition, Defense assigns unique numbers to each system in DIST, but these numbers are not universally used throughout the Department. The different number schemes make it more difficult to facilitate the exchange of information between these systems. Use of the same identifying number for each system throughout DOD is also important because Defense often changes the names of its information systems over their life. Without consistent identification numbers, tracking an information system in the face of such name changes is more arduous.

Defense recognizes that it needs better information to deal with migration and other technology issues for which DIST is relied on, such as the Year 2000 problem.¹ In November 1996, the Under Secretary for Defense (Comptroller) and the ASD C3I issued a joint memorandum to senior Defense managers stating that DIST was the backbone tool for managing the Department's information technology investment and that to be effective, it must contain accurate data on all the Department's information systems. The memorandum also stated that registration of information systems in the DIST was mandatory. However, the minimum set of data that is required under this joint memorandum focused on information needed to address Year 2000 issues and did not include

¹The Year 2000 problem refers to the possibility that many computer systems will fail on New Year's morning in the year 2000 because they were not designed to accommodate the change of date to the new millennium.

Appendix IV
Detailed Analysis of Database Used to
Collect Migration Information

critical information on migration implementation dates, cost, savings, and performance measures.¹

¹See chapter 4, footnote 1, for recent Defense developments regarding DIST.

Major Contributors to This Report

Accounting and
Information
Management Division,
Washington, D.C.

Cristina T. Chaplain, Communications Analyst
Danny R. Latta, Assistant Director, Policies and Issues
Harold J. Brumm, Jr., Economist

Kansas City Field
Office

George L. Jones, Evaluator-in-Charge
David R. Solenberger, Senior Evaluator
Karen S. Sifford, Staff Evaluator
John G. Snavelly, Staff Evaluator
Michael W. Buell, Staff Evaluator
Karl G. Neybert, Staff Evaluator

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